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Physical activity patterns, attitudes and counselling among adults with mental illness

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ABSTRACT

The life expectancy of adults with mental illness is significantly less than that of the general population. This is largely due to poor physical health. Physical activity is consistently recommended for the prevention and management of non-communicable diseases and also has mental health benefits. The aim of this thesis was to understand and promote physical activity in adults with mental illness, to improve physical health.

Study One was a cross-sectional study of inpatients in a private hospital. It assessed the (i) feasibility of self-report and objective measurement of physical activity and sedentary behaviour, (ii) levels of physical activity and sedentary behaviour, and (iii) physical activity attitudes and preferences for contexts and sources of support. 101 participants completed questionnaires on physical activity and sitting time, activity preferences and attitudes, psychological distress and sociodemographic and health variables. 38 also wore an accelerometer for 7 consecutive days.

Feasibility of measurement was assessed in terms of participant engagement; self-reported ease/difficulty; extreme self-report data values; and adherence to accelerometer wear time criteria. Findings demonstrated that inpatient adults with mental illness can engage with both questionnaire and accelerometry measurement, that it was more feasible but less acceptable to wear an accelerometer than to complete questionnaires, and that this was not influenced by level of psychological distress.

Questionnaire data were used to determine time spent in (i) walking and moderate- and vigorous-intensity activity (MVPA), and (ii) domain specific sitting time. Accelerometry was used to determine mean daily time spent in MVPA and sedentary behaviour. Bivariate associations between self-reported MVPA, sedentary behaviour and explanatory variables of gender, age, education, body mass and distress were analysed using regression analyses. Self-report data indicated a median of 32 minutes/day in MVPA and a median of 761 minutes/day in sedentary behaviour.

Accelerometry data indicated an average of 37 minutes/day in MVPA and 664 minutes/day in sedentary behaviour. Analyses indicated no significant associations between explanatory variables and MVPA or sedentary behaviour.

Questionnaire data were used to determine (i) physical activity interest; (ii) reasons to do activity; (iii) general knowledge regarding activity benefits; (iv) preferences for activity type, context and sources of support; and (v) activity barriers. More than three quarters (77%) of participants expressed high interest to do physical activity while in hospital, with the most common reasons being to maintain physical health and improve emotional wellbeing (≥95%). More than 90% of participants agreed physical activity was beneficial for managing psychological wellbeing, heart disease, stress, diabetes and quality of life; but fewer than half agreed that activity had benefits for serious mental illness. Participants preferred walking; activity that can be done alone, at a fixed time and with a set routine and format; and a personal trainer, physiotherapist or an exercise physiologist to recommend, design or lead physical activity programs. Major barriers were fatigue and lack of motivation. There were no significant preference differences by level of psychological distress.

Study Two was a nurse-led, two stage single group intervention trial that evaluated the effectiveness of a behavioural counselling program on improving metabolic health indicators, physical activity levels and psychosocial wellbeing of outpatient adults with mental illness. Participants received counselling every three weeks during stage one (19 weeks) and every six weeks during stage two (additional 12 weeks), and attended progress review sessions with a medical practitioner every six weeks. Assessment included self-report questionnaires of physical activity, sedentary behaviour and psychosocial wellbeing; objective measurement of physical activity and sedentary behaviour; blood pressure and anthropometric measurement. Of the 21 participants who consented, 16 completed stage one and 10 completed stage two of the intervention. During stage one, there were statistically significant improvements in waist circumference (-2.7cm, 95%CI -5.15, -0.22, $p<0.035$), and psychological quality of life (9.14, 95%CI 0.10, 18.18, $p=0.048$). During stage two, there were statistically significant reductions in waist circumference (-7.1cm, 95%CI 1.17, 12.93, $p=0.024$) and weight (-5.51kg, 95%CI 1.07, 9.95, $p=0.033$).

Conclusions: Inpatient adults with mental illness are interested in activity programs and can achieve good levels of physical activity. Inpatients can engage with activity questionnaires and monitors, but may be reluctant to wear activity monitors and find sedentary behaviour questionnaires difficult. It is recommended that inpatient activity programs highlight the benefits for serious mental illness, focus on walking, be led by staff with exercise expertise, and include strategies to allow for fatigue and support motivation. There is a need for inpatient interventions to reduce sedentary behaviour. Physical activity counselling may be an effective strategy for improving the physical health of adults with mental illness, and can reduce waist circumference and weight, and improve quality of life. It is recommended that behavioural counselling programs involve face-to-face sessions at a frequency of least every three weeks, be sustained over time, and have an ‘open door’ policy to allow for attendance interruptions that may be caused by deteriorations in mental or physical health.

DECLARATION BY AUTHOR

This thesis is composed of my original work, and contains no material previously published or written by another person except where due reference has been made in the text. I have clearly stated the contribution by others to jointly-authored works that I have included in my thesis.

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Dr Nicola Burton, Professor Harvey Whiteford and Professor Wendy Brown provided assistance with the original concept and design of the overall thesis objectives, provided support and guidance throughout data collection, analyses and interpretation of data, and offered considerable input into editing all written work contained in this thesis.

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Mental health, adult, physical activity, sedentary behaviour, attitudes, measurement, counselling.

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LIST OF ABBREVIATIONS

<: Less than

≤: Less than or equal to

>: Greater than

≥: Greater than or equal to

BMD: Bone mineral density

BMI: Body mass index

BP: Blood pressure

BPAD: Bipolar affective disorder

CI: Confidence interval

cm: Centimeters

CVD: Cardiovascular disease

DALYs: Disability adjusted life years

DASS: Depression, anxiety and stress score

DBP: Diastolic blood pressure

FITT: Frequency, intensity, type, time

GAD: Generalised anxiety disorder

GDP: Gross domestic output

HBA_{1C}: Glycated haemoglobin

HDL: High density lipoprotein

HIIT: High intensity interval training

HR: Hazard ratio

IDF: International Diabetes Federation

IQR: Interquartile range

K6: Kessler scale

kg: Kilograms

LDL: Low density lipoprotein

MET: Metabolic equivalent of tasks

mmHg: Millimeters mercury

mmols: Millimole

MVPA: Moderate to vigorous physical activity

NHANES: National Health and Nutrition Examination Survey

OCD: Obsessive compulsive disorder

OR: Odds ratio

PTSD: Post traumatic stress disorder

QOL: Quality of life

RCT: Randomised control trial

SBP: Systolic blood pressure

SD: Standard Deviation

SET: Supervised exercise training

SMD: Standardised mean difference

SPSS: Statistical package for the social sciences

T2DM: Type two diabetes mellitus

TC: Total cholesterol

TG's: Triglycerides

UK: United Kingdom

WC: Waist circumference

WHOQOL-BREF: World Health Organisation Quality of Life – Brief Inventory

WHtR: Waist to height ratio

CHAPTER 1: Literature Review

The aims of this chapter are to provide a rationale for physical activity promotion among adults with mental illness, to identify the gaps in the extant literature that led to the development of the research objectives and to present the overall structure, aims and objectives of this thesis.

The first section of this literature review describes the public health burden of mental illness (1.1) and an overview of the inequalities in health of adults with mental illness (1.2). The physical and psychological benefits of physical activity are presented (1.3), and are followed by an overview of measurement (1.4) and the levels of physical activity and sedentary behaviour of adults with mental illness (1.5). The next section discusses physical activity preferences and attitudes among adults with mental illness (1.6). The final section considers methods for physical activity promotion (1.7). The chapter then presents a summary identifying the gaps in the literature (1.8), the aims and objectives of this thesis (1.9 and 1.10), and concludes with an outline of the thesis (1.11).

1.1 The public health burden of mental illness

Globally, mental illnesses have a high prevalence and affect people across all regions of the world. A recent systematic review and meta-analysis of 174 surveys conducted between 1980 and 2013 from 64 countries found that one in five people (20%) reported having a mental illness in the 12 months preceding the survey and that 29.2% identified as having a mental illness at some point in their lifetime [1]. Mental health, neurological and substance use disorders account for 10.4% of all-cause disability adjusted life years (DALYs), with mental illness accounting for the highest proportion (56.7%) of these DALYs [2]. Mental illnesses are the fifth leading cause of global DALYs [3] and account for 37% of healthy life-years lost from non-communicable diseases [4]. Depression alone, which has a global point prevalence of 4.7%, is projected to be the primary global cause of disease burden by 2030 [5,6].

Within the Australian context, data from the 2007 National Survey of Mental Health and Wellbeing indicate that 45% (7.3 million) of Australian adults experience a mental illness or substance use disorder in their lifetime [7,8]. Approximately 20% of Australian adults have a mental illness or substance use disorder in a 12-month period [9], with just over a third accessing services for mental health problems [10].

The global cost of mental illness in 2010 was US $2 trillion and this is expected to surge to USD $6 trillion by 2030 [11]. In terms of lost economic output, this amount could increase to US $16 trillion in the next 20 years which is equivalent to 25% of the global gross domestic output (GDP) in 2010 [11]. In Australia, the economic cost of mental illness is also significant, with costs to the health care system in 2011-2012 estimated to be $7.2 billion, and the costs from loss of productivity in the Australian workforce in 2010 approaching $6 billion [7,12].

1.2 Inequalities in health of adults with mental illness

The life expectancy of adults with mental illness is significantly less than that of the general population. A study conducted in Western Australia found that in 2005, the life expectancy of adults with mental illness who had had contact with psychiatric services in the past five years were lower than the general population by 15.9 years for males and 12 years for females, and that these gaps had increased by approximately two years since 1985 [13]. Internationally, studies have also demonstrated similar life expectancy gaps for adults with mental illness. A study which examined patients with mental illness in the Nordic countries of Denmark, Sweden and Finland found that life expectancy was reduced by 15 years in females and 20 years in males [14]. Among adults diagnosed with schizophrenia and bipolar disorder in Demark, a study found that the average gap in life expectancy was 16 years for males and 14 years for females when compared with the general population [15]. Furthermore, a study conducted in South London found that the average gaps in life expectancy among patients with mental illness from a secondary care case registrar during 2007-2009 were 11.3 years for females and 14 years for males [16].

These studies highlight a significant global concern regarding the poor life expectancy of adults with mental illness. Notably, the life expectancy gaps of this population are worse than other disadvantaged groups. For example, in Australia, indigenous (Aboriginal and Torres Strait Islander) adults have a reduced life expectancy of 12 years for females and 10 years for males when compared with non-indigenous Australians [17]; and in a study of lifelong smokers (a population that receives significant public health resources), results indicated a reduced life expectancy of 10 years when compared to non-lifelong smokers [18]. Although high, these life expectancy gaps are less than that for mental illness.

The reduced life expectancy of adults with mental illness are largely due to poor physical health status [19,20]. In Western Australia, a study indicated that 77.7% of excess deaths among adults with mental illness were attributable to physical health conditions, with cardiovascular disease (CVD) and cancer respectively accounting for 29.9% and 13.5% of deaths across all mental illnesses [13]. Studies indicate that adults with mental illness also have an increased risk of respiratory diseases and some cancers [13,20-22]; and have at least a two-fold increased prevalence of metabolic risk factors including abdominal obesity, hypertension, insulin resistance and dyslipidemia, and a constellation of these risk factors (metabolic syndrome) significantly increases their risk for chronic conditions such as type two diabetes mellitus (T2DM) and CVD [19,20,23-26]. The prevalence of metabolic syndrome among adults with mental illness is high, with studies suggesting 35-47% of adults with schizophrenia [27,28] and 33-37% of adults with bipolar affective disorder [27,29] have metabolic syndrome. In Australia, the prevalence of metabolic syndrome among adults with mental illness is 54%, which is almost double that seen in the general population [20,30].

1.3 Benefits of Physical activity

1.3.1 Physical health benefits

Physical activity may be an effective strategy for improving the poor physical health of adults with mental illness as it has been recommended for the prevention and management of many metabolic risk factors and non-communicable diseases in the general population. Physical activity is defined as any bodily movement produced by large skeletal muscles that results in an increase in energy expenditure [31]. Physical activity is expressed in metabolic equivalent of tasks (METs) and is categorised as light (1.6 – 3.0 METs), moderate (3.0 – 6.0 METs) or vigorous (> 6.0 METs) activity [32]. It can be conceptualised into four different domains: (i) recreational (i.e. leisure time physical activity, e.g. walking or sport participation); (ii) active transport (i.e. walking to and from places); (iii) occupational (i.e. for a job) or (iv) domestic (i.e. house and yard work) physical activity [33].

Studies indicate that physical activity significantly improves metabolic risk factors such as overweight/obesity, elevated triglycerides (TGs), hypertension, low high-density lipoprotein cholesterol concentrations (HDL-C) and impaired glycemic control, and reduces the risk of T2DM [34-36]. A review of 43 randomised controlled trials (RCTs) of overweight or obese adults indicated that physical activity reduced serum triglycerides by -0.2mmol/L (95% CI -0.1 to -0.3, $p < 0.01$); serum glucose by -0.2mmol/L (95% CI -0.1 to -0.3, $p = 0.006$); and diastolic blood pressure by -2mmHg (95% CI -1 to -4, $p = 0.01$) [35]. A review of 14 RCTs of adults with T2DM, concluded that physical activity (aerobic, fitness training or resistance training) reduced plasma triglycerides by -0.25mmol/L (95% CI -0.48 to -0.02); glycated haemoglobin levels by -0.6% (95% CI -0.9 to -0.03, $p < 0.05$); and visceral adipose by -45.5cm^2 (95% CI -63.8 to -27.3) [36]. More recently, a meta-analysis of seven randomised and clinical control trials indicated that regular physical activity (dynamic endurance training) has benefits for adults with metabolic syndrome, with reductions in waist circumference (-3.4cm, 95% CI -4.9 to -1.8), diastolic blood pressure (-5.2mmHg, 95% CI -6.2 to -4.1); plasma glucose (-0.31mmol/L, 95% CI -0.64 to 0.01), and plasma triglycerides (-0.05mmol/L, 95% CI -0.20 to -0.09); and increases in HDL-C (0.06, 95% CI 0.03 to 0.09) [34].

Physical activity is also associated with a reduced CVD risk, with one meta-analyses indicating a risk reduction of 35% (95% CI 30 – 40%) [37]. Another meta-analysis concluded that high levels of leisure time physical activity and moderate levels of occupational physical activity both have benefits for reducing overall risk of coronary heart disease and stroke among men and women, by 20 – 30% and 10 – 20% respectively [38].

Physical activity has also been shown to have benefits for improving the bone mineral density (BMD) of postmenopausal women with osteoporosis. A review of RCTs indicated that when compared with control groups, progressive resistance training for lower limbs was the most effective in improving the BMD in the neck of femur, with a mean difference between groups of 1.03 (95% CI 0.24 to 1.82). [39]. Combined physical activity programs were most effective in improving BMD in the spine, with a mean difference between groups of 3.22 (95% CI 1.80 to 4.64) [39].

Several studies have also specifically examined the physical health benefits of physical activity in adults with mental illness and have indicated reductions in weight and improvements in cardiorespiratory fitness. A RCT of 279 overweight/obese adults with mental illness, who participated in an 18 month tailored behavioural intervention consisting of individual weight management sessions and group exercise sessions, indicated a mean between group weight reduction of -3.2kg ($p = 0.002$) [40]. An eight-week program of high intensity interval training (HIIT) among adults with chronic schizophrenia demonstrated a mean weight reduction of -1.45kg ($p < 0.05$) [41]. The results of a recent meta-analysis also indicated physical activity interventions improved cardiorespiratory fitness in adults with schizophrenia by 4 – 4.5 ml/kg/min following a 6 – 8 week program [42].

Physical activity may therefore also be an effective strategy for managing the cardio-metabolic risk factors associated with prolonged (habitual) sedentary behaviour [43,44]. Sedentary behaviour is defined as any waking behaviour that is characterized by an energy expenditure of ≤ 1.5 METs while in a sitting or reclining position [45]. Common examples include television viewing, computer use or sitting in an automobile [46]. Similar to physical activity, sedentary behaviour can occur in different domains, i.e. occupational, during leisure time, or for transport. Studies have indicated that there is a dose-response relationship between time spent in prolonged sedentary behaviour and obesity, metabolic syndrome and all-cause CVD mortality in the general population [47-51]. This is further evidenced by a recent systematic review and meta-analysis, which concluded that increased time spent in sedentary behaviour was found to increase all-cause mortality (HR 1.240, 95% CI 1.090 to 1.410), CVD mortality (HR 1.179, 95% CI 1.106 to 1.1257), cancer mortality (HR 1.173, 95% CI 1.108 to 1.242) and T2DM incidence (HR 1.910, 95% CI 1.642 to 2.222) [52].

1.3.2 Psychological health benefits

Physical activity also has benefits for protecting and improving the psychological wellbeing of adults with mental illness across the lifespan [53-56]. A review of RCTs indicated that there is an inverse relationship between physical activity and depression [57] and a recent meta-analysis showed that physical activity has a moderate antidepressant effect when compared with no treatment or placebo [58]. Physical activity has also been shown to have a positive effect on anxiety disorders (i.e. general anxiety, obsessive compulsive disorder [OCD] and post-traumatic stress disorder [PTSD]) beyond the placebo effect [59-62]. Two systematic reviews of adults diagnosed with general anxiety, indicated that both aerobic and non-aerobic physical activity reduces anxiety and may have benefits as an adjunctive treatment [61,62]. A study of 15 adults with OCD who participated in a 12-week moderate intensity aerobic physical activity program indicated acute reductions in both obsessions and compulsions, with the average Cohen's effect size for obsessions at week 12 reducing to -0.29 from -0.62 at week one, and for compulsions at week 12 reducing to -0.14 from -0.77 at week one [59]. Furthermore, a study conducted with adults diagnosed with PTSD indicated that 89% of 33 participants who participated in a two week, six session aerobic physical activity program, reported clinically significant reductions in PTSD [60].

One of the known methods by which physical activity improves depressive and anxiety symptoms is through increasing the uptake of the neurotransmitter serotonin in the brain [63-65]. There are two mechanisms by which this occurs. The first is that motor activity increases the rate and frequency which serotonin is 'fired' within the brain, resulting in increases in both the release and synthesis of serotonin; and the second is that regular physical activity increases the levels of an amino acid (tryptophan) used to manufacture serotonin [65]. Physical activity also improves depression and anxiety in individuals by improving body image, increasing social support and providing a distraction for negative thoughts [63,66]. A qualitative study in which 33 participants reported improvements in depression suggested that physical activity also provided structure to daily life and regulated sleep patterns [67].

Physical activity has also been found to improve neuro-cognition, negative and positive symptomology, and functional disability in adults with schizophrenia [55,68-72].

A meta-analysis of 659 adults from 17 trials examining the benefits of physical activity interventions for adults with schizophrenia, found that doing an average of 90 minutes/week of aerobic activity resulted in an improvement in total psychiatric symptoms (SMD -0.72, 95% CI: -1.14 to -0.29) [68]. Furthermore, this study indicated that both negative and positive symptoms of schizophrenia were improved by engaging in moderate- to vigorous-intensity physical activity, with pooled SMDs of -0.54 (95% CI: -0.95 to -0.13) and -0.44 (95% CI: -0.78 to -0.09) respectively [68]. Findings from the few studies that have been conducted among adults with bipolar affective disorder (BPAD) indicate that physical activity may reduce both depression and anxiety, improve acute wellbeing and reduce stress [73-75]. Physical activity has also been positively related to improvements in quality of life across the spectrum of mental illnesses [72,76-78].

The poor physical health of adults with mental illness is a serious public health concern and physical activity can help prevent and manage poor physical health and contribute to improved psychological health. There is an urgent need therefore, to develop innovative strategies to increase physical activity among adults with mental illness.

1.4 Measuring physical activity and sedentary behaviour among adults with mental illness

Physical activity and sedentary behavior are typically assessed using a variety of self-report (i.e. questionnaires) and objective (i.e. pedometers, accelerometers) measures. Questionnaires have high practicality in that they are easy to administer, are low cost and have minimal interference with usual habits [79]. Questionnaires are also advantageous in that they provide descriptive information regarding context, i.e. activities done at home versus at work, and the type of physical activity done. They are however, prone to reporting errors and recall bias and can have a high administrative burden for participants as they can take a considerable amount of time to complete [80,81]. The potential for reporting errors and recall bias may have resulted in the reported discrepancies between the self-report and objective measures of physical activity among adults with mental illness in previous research

[82]. Objective measures do not rely on participant recall or reporting, and may be less burdensome than questionnaires. Some monitors (e.g. accelerometers) are however costly, and poor adherence to wear time protocols and forgetting to wear the monitor may negatively impact on the feasibility of using such devices.

Given that adults with mental illness may have impairments in cognitive function, including concentration, memory and executive function [83,84], the feasibility of measuring physical activity and sedentary behaviour may be particularly relevant in terms of difficulties in understanding and completing requirements. Previous studies of physical activity and sedentary behavior data collection methods among adults with mental illness have primarily focused on the reliability and validity of the measures and have been carried out with people in community settings [85-88]. Little work however, has been done to examine the feasibility and acceptability of data collection methods from a patient centered perspective among adults with mental illness. One study of 142 adults living in the community with mental illness concluded that it is feasible for participants to engage with self-report and objective measures of physical activity and sedentary behaviour [89]. More specifically, it was found that questionnaires were feasible for assessing physical activity but were less acceptable among people experiencing high distress and that accelerometers were more feasible for assessing sedentary behaviour than questionnaires [89].

Few studies have assessed adherence with objective measurement wear time criteria in adults with mental illness. Those studies that have, have primarily been done with adults diagnosed with schizophrenia, and with small sample sizes. One study found all participants (n = 4) were able to wear an accelerometer for 7 out of 7 days [90], and another found that 87.5% of 21 participants were able to wear a pedometer for 6 out of 7 days [91].

1.5 Physical activity and sedentary behaviour among adults with mental illness

The Australian physical activity guidelines state that adults should engage in at least 150-300 minutes/week of moderate- to vigorous-intensity physical activity (MVPA) [92]. However, the majority of Australians are not meeting these recommendations. This is evidenced by the results of the 2011-2012 Australian Health Survey which indicated that only 43% of adults were sufficiently active, i.e. doing ≥150 minutes/week of MVPA [93].

Studies which have specifically examined the physical activity and sedentary behaviour levels of adults with mental illness have predominantly been subsumed in population-based surveys [94] or carried out in community settings [95-97] and provide mixed results. One Australian survey reported that 64.5% of a sample of 1,825 people with psychoses living in the community were active [94]. Another survey reported that 49% of 150 adults with schizophrenia living in the community were achieving >150 minutes of physical activity per week [97]. The 2007-2008 Health Survey of Australia did not specifically target adults with mental illness, however it indicated that adults who had high or very high levels of psychological distress, were less likely to achieve at least 150 minutes/week of moderate intensity activity than those with lower levels of distress [98].

Self-report data from an Australian study of 109 adults living in the community with anxiety or depression, indicated that 51% of participants were meeting physical activity guidelines [99]. This is similar to the self-report data from an Australian study of 142 adults living in the community with a range of mental illnesses, which indicated that participants were meeting physical activity guidelines with an average of 39 minutes/day spent in MVPA [82, 92]. Participants however, spent a large amount of time sitting and reclining, with results indicating that two thirds of total daily waking time was spent in sedentary behaviour (10.7 hours/day) [82]. Objective accelerometry data (n=101) from this study demonstrate that participants may have over-estimated their self-reported MVPA, with results indicating an average time of 26 minutes/day in MVPA. The accelerometer data did however, yield similar results to the self-report data for time spent in sedentary behaviour (9.2 hours/day) [82].

The self-report and accelerometry results from these Australian studies are similar to other international studies of adults with mental illness living in the community. Accelerometer results from a Swedish study of 165 adults with anxiety and depression, indicated an average time of 42 minutes/day in MVPA and 9.1 hours/day in sedentary behaviour [100]. Similarly, accelerometer results from an American study of 81 adults with schizophrenia indicated an average time of 32 minutes/day in MVPA and 8.9 hours/day in sedentary behaviour [101]. Another American study of 4058 adults with moderate to severe depression indicated an average time of 25 minutes/day in MVPA [102]. Participants in this study however, spent notably less time in sedentary behaviour (7.4 hours/day) [102] which was similar to the results of a study of 30 American adults with schizophrenia spectrum disorders who spent an average time of 6.75 hours/day in sedentary behaviour [103]. In contrast to these studies, accelerometer data from 60 American outpatient adults with BPAD found an average time of 14 minutes/day in MVPA [96]. Participants in this study also spent a greater amount of time in sedentary behaviour (13.5 hours/day) [96] than reported in the other studies. The low levels of physical activity were also reflected in another American study, which concluded that only 35% of 55 overweight/obese adults with severe mental illness achieved ≥150 minutes/week of MVPA [104].

Little research has purposively assessed inpatient adults with mental illness. Only one study was located, and suggested that inpatient adults with schizophrenia in Poland have statistically significant lower levels of physical activity than healthy controls [105]. However, the time spent in physical activity was not reported in this study, as the main outcome was to compare the effects of different antipsychotics on physical activity. It can therefore be concluded that there is a paucity of evidence available regarding the levels of physical activity and sedentary behaviour among inpatient adults with mental illness.

1.6 Physical activity preferences and attitudes among adults with mental illness

Understanding attitudes towards and preferences for doing physical activity may help understanding of the levels and patterns of physical activity in adults with mental illness, as well as inform the development of interventions. Studies of adults in the general population indicate preferences for walking [106,107]; activities that are done close to home, outdoors, are unstructured and non-competitive [108,109]; and a preference for physical activity advice from a health professional [107]. Studies on barriers to physical activity among the general population have suggested insufficient time, lack of motivation, weather, physical health problems and work commitments [107,109,110]. However, adults with mental illness may have different preferences for how, where and sources of support to do physical activity, and different attitudes.

Adults with mental illness perceive physical activity as important for improving physical and mental health [111-113]. In a qualitative study of 34 adults with mental illness living in the community, participants viewed physical activity as positive and desirable, despite describing multiple barriers. They found that physical activity improved energy levels, decreased stress, improved sleep and provided a good source of distraction [112]. Similarly, the results of another qualitative study of 16 adults with mental illness also living in the community, indicated that participants had a desire to engage in physical activity and perceptions that physical activity was good for both physical and mental health [111]. Furthermore, a cross-sectional study of 120 adults residing in either community or hospital settings, indicated that the vast majority of participants reported they believed in the benefits of physical activity for both physical and mental health [113]. Neither of these later studies however, reported on the specific perceived benefits of physical activity for physical and mental health.

Few studies have examined the physical activity preferences and attitudes of adults with mental illness, and those that have, have predominantly been conducted among people living in the community. Studies on the physical activity preferences of adults with mental illness living in the community have suggested walking [95,113,114], and activities done at or close to home [109,113]. For adults with psychological distress in the general population, preferred activities are those that involve little or no cost, can be done alone and outdoors, are supervised and are done at fixed times with scheduled sessions [115]. In terms of sources of support, studies indicate that adults with mental illness prefer physical activity advice from a doctor [113,114] and support from a trainer [114]. Studies on barriers to physical activity have indicated mental illness symptoms, sedative effects of medications, weight gain, low motivation, fatigue, safety fears, financial limitations and limited experience in doing physical activity [112,114,116-118].

1.7 Physical activity promotion

Physical activity may be a feasible, acceptable and effective adjunctive therapy to usual care for adults across a range of mental illnesses [119]. Integrating physical activity may therefore be a fundamental treatment component in the prevention and management of many mental and physical health problems that are prevalent in adults with mental illness [55,120]. Two common methods to promote physical activity are supervised exercise training and physical activity counselling.

1.7.1 Supervised exercise training

Supervised exercise training (SET) can involve a variety of activities, i.e. running, walking, cycling, dancing, resistance training and flexibility training such as yoga, tai chi, and high intensity interval training (HIIT). Studies have indicated that adults with mental illness can participate in SET as evidenced by high program adherence rates. A meta-analysis of adults with depression who engaged in SET for a mean duration of 9.4 weeks for 3 sessions/week indicated high adherence rates for program completion (81.3%) [58]. Similarly, a meta-analysis of data from adults with a range of mental illnesses who engaged in SET for 10-24 weeks for 2-4 sessions/week also demonstrated high adherence rates for program completion (81.1%). A RCT of ten females with generalized anxiety disorder (GAD) who participated in six weeks of SET reported 100% program completion rates and indicated that physical activity is an effective adjunctive treatment for GAD [121]; while a RCT of 33 participants with PTSD who participated in SET for two weeks for four sessions/week reported adherence rates of 82% [60].

Studies indicate that SET has benefits for improving both the physical health and psychological wellbeing of adults with mental illness. A review of 13 studies indicated that SET is feasible and effective in reducing weight (i.e. by 5.7% after 24 weeks) and improving obesity related cardio-metabolic risk factors (i.e. diastolic blood pressure [DBP] by 5.6mmHg – 9.4mmHg) in adults with schizophrenia [122]. Similarly, a meta-analysis of adults with mental illness found that SET is effective in reducing symptomology in depression and schizophrenia (SMD = 0.80 and 1.0 respectively), and for improving anthropometric measures (SMD = 0.24), aerobic capacity (SMD = 0.63) and quality of life (QOL) (SMD = 0.64) among adults with mental illness [55]. A systematic review of adults with schizophrenia who engaged in a supervised yoga program of 8-16 weeks duration, also demonstrated that SET is an effective adjunctive therapy to reduce both positive and negative symptoms [123]. Results from a study of 18 adults with schizophrenia who engaged in an eight week HIIT program (repetitions of high intensity exercise that boosts the heart rate to 85% - 95% maximal heart rate [41], separated by medium intensity exercise with a warm up and cool down period), consisting of three sessions/week, each of 25 minutes duration, reported statistically significant mean changes in weight (-1.5kg, $p = 0.022$), body mass index (BMI) (-0.6 kg/m^{2}, $p = 0.022$) and resting heart rate (-3.5 beats/minute), and reported adherence rates of 78% [41].

1.7.2 Physical activity counselling

Physical activity counselling is an individualised and purposeful approach that is discourse based (i.e. presented in a verbal or written format) and can be delivered via different mediums (i.e. face-to-face, telephone, online, email). Two common approaches to successful physical activity counselling are Motivational Interviewing [124,125] and the 5As Model [126,127] which are described below. These are often applied within a Social Cognitive Theory framework which suggests that an individual's personal factors, their environment and their behaviour all impact, sometimes simultaneously, on engagement in physical activity [128-130]. The main constructs of this theory are summarised in Table 1-1.

Table 1-1: Major Concepts of the Social Cognitive Theory

Concept	
Environment	Factors that affect a person's behaviour that are physically external to that person. For example: weather, social networks, infrastructure
Situation	A persons perception of their own environment
Behavioural Capacity	A persons knowledge of the specific behaviour and their level of ability or skills to perform it
Expectations	The anticipatory outcomes of a behaviour
Expectancies	The values (positive or negative) a person places on a particular behaviour
Self-control	A persons formed beliefs about what they can do. A person sets goals and plans a course of action to achieve the expected outcome or behaviour
Observational Learning	A behaviour is learnt from watching the actions and outcomes of another persons behaviour
Reinforcements	A response to a person's behaviour that is likely to increase or decrease the likelihood of reengagement in that behaviour
Self-efficacy	The confidence a person has in performing and overcoming barriers for a particular task
Emotional Coping Responses	Strategies that a person utilises to deal with emotional stimuli and competing demands

Motivational Interviewing

Motivational interviewing is a person-centered counselling method that works through a person's ambivalence to elicit their motivations for committing to and making a healthy behaviour change [131]. Motivational interviewing is defined by the 'spirit' which is described as collaborative, evocative and honouring of a person's autonomy [132]. By honouring the spirit of motivational interviewing, the counsellor builds a cooperative and collaborative partnership with the person; seeks to evoke the person's personal goals, values and aspirations and reasons to make healthy behaviour changes; and recognises and honours a person's individual choices [132]. Motivational interviewing is bound by the four guiding principles of (i) *resisting the righting reflex,* in which counsellors roll with resistance and actively involve the person in the process of problem solving, (ii*) understanding the person's motivations,* in which the counsellor explores the person's own perceptions about their current situation and their own personal motivations for change, (ii) *listening to the person,* in which the counsellor empathically listens to the person to gain a full understanding of the person's story and (iv) *empowering the person,* in which the counsellor supports self-efficacy and helps the person to explore how they can make healthy behaviour changes [124,132].

5A's Model

The 5A's Model of behavioural counselling identifies five key components of the counselling process that need to occur to promote change: assess, advise, agree, assist and arrange [126,127,133]. An overview of these components as applied to physical activity counselling is presented in Table 1-2 and discussed in more detail in Chapter 5.

Table 1-2: The 5A's Model for physical activity counselling

Stage	Intervention
Assess	• Knowledge and beliefs regarding physical activity. • Current physical activity levels. • Psychosocial factors. For example: readiness, reasons, barriers and enablers to change, social support and self-efficacy.
Advise	• Provide personalised advantages for engaging in physical activity. • Confirm the individual's understanding of physical activity and correct any misconceptions they may have. • Clear and strong advice to do physical activity.
Agree	• Establish a contract with the individual to engage in behaviour change. • Collaborative goal setting • Respond to any ambivalence the individual may have towards physical activity engagement.
Assist	• Collaborate to make an action plan for engaging in physical activity. • Provide a written copy of the agreed action plan, printed support materials and self-monitoring tools. • Explore approaches used to change activity in the past. • Identify coping strategies that the individual can utilize to manage

		competing life demands and barriers to physical activity.
	•	Provide support and positive reinforcement.
	•	Provide written resources.
Arrange	•	Arrange a follow-up counselling session.

1.7.3 Impact of physical activity counselling

An extensive body of research has examined the effectiveness of physical activity counselling among the general population. A Cochrane review found consistent evidence that face-to-face physical activity counselling interventions of at least 12 months duration is efficacious in increasing self-reported physical activity [134]. This is further supported by several systematic reviews, all of which conclude that physical activity counselling has a positive effect on increasing self-reported physical activity among the general population [124,135,136]. A meta-analysis concluded that physical activity counselling interventions based on a motivational interviewing framework produce significant and positive impacts on total cholesterol (TC), blood pressure (BP), body weight, QOL, sedentary behaviour and intention to change and engage in physical activity [137]. A RCT among older people found that after a 3-month physical activity counselling intervention, improvements were found in leisure time moderate-intensity physical activity and health related QOL at 12 months follow-up [138]. Physical activity counselling has also been shown to improve the effectiveness of a pedometer based intervention, with results indicating that participants who received counselling increased their number of steps more than those who did not receive the counselling (28% versus 16%) over a 12 month period [139].

Studies indicate that physical activity counselling is also effective in increasing physical activity and improving the physical and psychological health of people with a chronic health condition, i.e. T2DM and CVD. A systematic review of physical activity counselling interventions that ranged between 3-18 months in duration indicated significant improvements in reported physical activity levels, glycated haemoglobin (HbA_{1C}) and physical health status, reductions in weight and positive outcomes for self-efficacy and mental health status [140]. A recent meta-analysis also concluded that physical activity counselling has a small positive effect in increasing physical activity levels among people with chronic health conditions relative to comparison groups [125].

Furthermore, a RCT of 75 people with T2DM which examined the effects of a 12 month physical activity counselling intervention on glycemic control and CVD risk factors indicated significant improvements in physical activity from baseline to six months that was maintained at 12 months, and significant between group improvements in systolic blood pressure (SBP), HbA_{1C} and TC [141].

Little research has examined the effectiveness of physical activity counselling among adults with mental illness. A recent pilot study of four obese adults with schizophrenia suggested that physical activity counselling is feasible in this population. The results indicated that although participants' physical activity levels did not increase over the two month study period, there were improvements in perceived benefits of physical activity and self efficacy, which are recognized determinants for physical activity [142]. Another study indicated that, when used in conjunction with a cognitive behavioural program, physical activity counselling improved participation in leisure time physical activity and significantly improved self-perceptions among participants with binge eating disorder [143]. Although not specifically focusing on *physical activity,* several studies have examined the effectiveness of *lifestyle* counselling among adults with mental illness (focusing on e.g. a combination of physical activity and diet). Results from these studies indicate that lifestyle interventions are effective in reducing weight [144-150], increasing physical activity participation [145], improving metabolic risk factors [68,147,148], quality of life [150] and psychiatric symptomology [68,149] among adults with mental illness. These studies provide further support that it is feasible and beneficial for adults with mental illness to engage in face-to-face behaviour change counselling interventions over a period of time.

1.8 Summary

The life expectancy of adults with mental illness is significantly less than that of the general population with studies indicating gaps of 12-15 years in females and 14-20 years in males. This reduced life expectancy is largely due to poor physical health among adults with mental illness, i.e. increased prevalence of metabolic risk factors, diabetes and cardiovascular disease. Studies indicate that physical activity is consistently recognised as having benefits for managing most metabolic risk factors and non-communicable diseases, and can improve psychological wellbeing across the lifespan. Physical activity could therefore, be a fundamental treatment component in the prevention and management of many physical health problems that are prevalent in adults with mental illness.

Research on the physical activity and sedentary behaviour of adults with mental illness can inform intervention planning. Previous studies of physical activity and sedentary behavior data collection methods among adults with mental illness have primarily focused on the reliability and validity of the measures, however *little work has examined the feasibility and acceptability of using these data collection methods from a patient centered perspective*.

Many studies that measure physical activity and sedentary behaviour and associated preferences and attitudes have not specifically targeted those with mental illness, and have mainly been carried out in community settings. Studies of adults with mental illness in the community have suggested a preference for walking; activities done at or close to home; physical activity advice from a doctor and support from a trainer; and barriers of sedation from medication, weight gain, low motivation, fatigue, safety concerns and financial limitations. However little is known about *the physical activity and sedentary behaviour among inpatient adults with mental illness*.

Two common methods to promote physical activity are supervised exercise training and physical activity counselling. Supervised exercise training has been shown to be efficacious in improving physical health among adults with mental illness. Behavioural counselling has been shown to improve physical activity in the general population and can have a positive impact on metabolic health risk factors in those with non-communicable conditions, *however little work has been done to evaluate use in adults with mental illness*.

To enhance understanding of physical activity among adults with mental illness, more research is therefore required on the:

- Feasibility and acceptability of physical activity and sedentary behaviour data collection methods;

- Physical activity and sedentary behaviour of inpatient adults with mental illness;
- Physical activity attitudes and preferences among inpatient adults with mental illness and;
- The effectiveness and impact of physical activity counselling among adults with mental illness.

Increasing understanding and knowledge in these areas may help to increase physical activity and reduce sedentary behaviour among adults with mental illness. If this can be achieved, this will then help to reduce the significant gaps in life expectancy due to poor physical health among this population.

1.9 Thesis aim

The overarching aim of this thesis is to understand and promote physical activity in adults with mental illness, to improve physical health.

1.10 Thesis objectives

The objectives of this thesis are to:

1. Assess the feasibility and acceptability of physical activity and sedentary behaviour data collection methods among inpatient adults with mental illness
2. Assess the physical activity and sedentary behaviour of inpatient adults with mental illness
3. Assess the physical activity attitudes to, and preferences for contexts and sources of support among inpatient adults with mental illness
4. Evaluate the effects of a metabolic health and physical activity counselling program to improve the metabolic health indicators, physical activity and psychosocial wellbeing of outpatient adults with mental illness.

1.11 Thesis outline

This thesis comprises two data collection studies: a cross-sectional study of adult inpatients with mental illness, and a single group intervention trial with adult outpatients with mental illness. The cross-sectional study examined measurement feasibility, levels of physical activity and sedentary behaviour, and attitudes and preferences. The intervention trial evaluated the effectiveness of a behavioural counselling program on improving metabolic health indicators, physical activity and psychosocial wellbeing.

Chapters 2, 3 and 4 present the papers arising from the cross-sectional study. The paper *The feasibility of using questionnaires and accelerometers to measure physical activity and sedentary behavior among inpatient adults with mental illness,* which is published in the *Journal of Physical Activity and Health* is presented in Chapter 2. The paper, *Physical activity and sedentary behaviour among inpatient adults with mental illness*, published in the *Journal of Science and Medicine in Sport* is presented in Chapter 3. The paper, *Physical activity attitudes and preferences among inpatient adults with mental illness*, published in the *International Journal of Mental Health Nursing* is presented in Chapter 4.

The repeated measures, single group intervention trial is presented in Chapter 5. This study will be adapted for submission for publication after thesis examination.

Chapter 6 presents the thesis discussion, including a summary of key findings. The unique contributions of this research are presented and the strengths and methodological limitations considered. The practical implications of this research are discussed, with suggestions for future research directions to understand and promote physical activity to improve the physical health of adults with mental illness.

CHAPTER 2: Feasibility Study

In the literature review in Chapter 1, the public health burden of mental illness and inequalities in health between adults with mental illness and the general population were reviewed. The life expectancy of adults with mental illness is significantly less than that of the general population, and this is largely due to poor physical health. Physical activity was identified as a key factor to potentially improve general health and life expectancy among adults with mental illness as it is recommended for the prevention and management of many metabolic risk factors and non-communicable diseases.

Prior to conducting physical activity research among adults with mental illness, e.g. for surveillance and to evaluate intervention studies, there is a need to understand whether common methods of collecting physical activity and sedentary behaviour data are feasible among this population. Adults with mental illness can have impairments in memory, executive functioning and concentration, which may be exacerbated during periods of high distress, e.g. during time spent as an inpatient in hospital. Inpatient adults with mental illness may therefore have difficulties in understanding and completing physical activity and sedentary behaviour data collection components.

This study explored the feasibility of two common data collection methods (questionnaires and accelerometers) for both physical activity and sedentary behaviour. It was intended that the outcomes of this study can help inform choice of data collection methods in future research with this patient group, as well as interpretation of research results.

This study has been published (online ahead of print) in the *Journal of Physical Activity and Health* (Impact Factor 2.090).

The citation is as follows:

Fraser, S.J., Chapman, J.J., Brown, W.J., Whiteford, H.A., and Burton, N.W. (2016) The feasibility of using questionnaires and accelerometers to measure physical activity and sedentary behavior among inpatient adults with mental illness. *Journal of Physical Activity and Health*, *13*(5), 551-557.

2.1 Abstract

Background: The aim of this study was to assess the feasibility of using questionnaires and accelerometers to measure physical activity and sedentary behavior among inpatient adults with mental illness.

Methods: Participants completed a physical activity and sitting time questionnaire and wore an accelerometer for seven consecutive days. Feasibility was assessed in terms of participant engagement, self-reported ease/difficulty of completing study components, extreme self-report data values and adherence to accelerometer wear time criteria. Ease/difficulty ratings were examined by level of distress.

Results: 177 inpatients were invited to the study, 101 completed the questionnaires and 36 provided valid accelerometry data. Participants found it more difficult to complete sitting time and physical activity questionnaires than to wear the accelerometer during waking hours ($z=3.787$, $p<0.001$; $z=2.824$, $p=0.005$ respectively). No significant differences were found in ease/difficulty ratings by level of distress for any of the study components. Extreme values for self-reported sitting time were identified in 27% of participants.

Conclusion: Inpatient adults with mental illness can engage with self-report and objective methods of measuring physical activity and sedentary behavior. They were initially less willing to participate in objective measurement, which may however be more feasible than self-report measures.

2.2 Introduction

Compared with the general population, adults with mental illness have a reduced life expectancy that is largely due to poor physical health status [13,15]. This may reflect the low levels of physical activity [151,152] and high levels of sedentary behavior [96,153] typically identified among adults with mental illness. To monitor these key health related behaviors there is a need to understand the usefulness of different data collection methods.

Physical activity and sedentary behavior can be assessed using self-report questionnaires, which have high practicality in that they are easy to administer, are low cost and have minimal interference with usual habits [79]. Questionnaires are also advantageous in that they can provide descriptive information regarding context, i.e. activities done at home versus at work, and the type of behavior done. They are however, prone to reporting errors and recall bias [80]. Objective measures, such as accelerometers, do not rely on participant recall or reporting, and may be less burdensome than questionnaires, however they are high cost. Poor adherence to accelerometer wear time protocols and forgetting to wear the accelerometer may also negatively impact on the feasibility of using such devices.

Previous studies of physical activity and sedentary behavior data collection methods among adults with mental illness have primarily focused on the reliability and validity of the measures and have been carried out with people in community settings [85-88]. Little work has been done to examine the feasibility and acceptability of self-report and objective data collection methods from a patient centered perspective among people with mental illness. A few studies have assessed adherence with objective measurement wear time criteria in outpatient populations of adults with schizophrenia, but many of these had small sample sizes. One study found all participants (n=4) wore an accelerometer for 7 out of 7 days [90] and another found that 87.5% of 21 participants wore a pedometer for 6 out of 7 days [91]. To our knowledge, no studies have been conducted exclusively on inpatient adults with mental illness, and compared patients' perspectives on self-report and objective data collection methods.

The primary aim of this study was therefore, to assess the feasibility of using self-administered questionnaires and accelerometers to assess physical activity and sedentary behavior among inpatient adults with mental illness. Given that adults with mental illness may have impairments in memory, executive functioning and concentration [83,84] and that these may be exacerbated during periods of high distress, issues of feasibility may be particularly relevant in terms of difficulties in understanding and completing study components. For example, in our previous study of 142 adults with mental illness living in the community, those with high distress found it more difficult to complete sitting time and physical activity questionnaires than those with low distress [89]. A secondary aim was therefore to compare perceptions of the ease/difficulty of data collection methods between participants with low-moderate and those with high distress.

2.3 Methods

This was a cross-sectional study.

Participants

Participants (n=101) were inpatient adults recruited from a private psychiatric hospital. Recruitment was conducted in two waves over an eight-month period. The hospital's daily inpatient census was obtained weekly and discussed with the charge nurse to select patients who met the following eligibility criteria: (i) a psychiatric diagnosis as defined by the Diagnostic and Statistical manual of Mental Disorders, 5th Edition; (ii) were not experiencing acute psychotic symptoms; (iii) were not acutely suicidal; (iv) were not under an involuntary treatment order. Eligible patients were verbally invited to participate in the study at least five days after admission, to allow time for them to settle into the hospital. This study received ethical clearance by The University of Queensland Human Research Ethics Committee (2014000420). Written informed consent was obtained.

Procedure

Participants were asked to complete self-administered physical activity and sedentary behavior questionnaires. The physical activity questionnaire was a modified version of the Active Australia questionnaire [154], and asked about the frequency of sessions and time spent walking for transport, walking for recreation and leisure, as well as in moderate- and vigorous- intensity activity over the previous week. The Active Australia questionnaire has been used in national and state population based surveys [154,155].

The sedentary behavior questionnaire was a modified version of a sitting time questionnaire which asks about time spent in (i) travelling to and from places, (ii) at work, (iii) watching television, (iv) using a computer and (v) leisure time [156]. To reflect the specific inpatient setting, leisure time was replaced with general relaxing and five additional sitting domains were added: (i) psycho-education group, (ii) art therapy group, (iii) with a health professional, (iv) smoking and (v) doing nothing. Participants were asked to report sitting time in each of the ten domains on each of a usual weekday and weekend day during the last week.

The Kessler (K6) scale [157] was used to assess psychological distress. It has been shown to have good reliability [158] and validity [157]. Possible scores range from 6–30. Sociodemographic variables were assessed by questionnaire and included gender, age, household composition, employment status and education. Data on weight and height (used to derive body mass index), blood pressure and diagnosis were retrieved from participants' medical records. Questionnaires were used to assess perceived ease/difficulty of completing study components.

Participants were also asked to wear an Actigraph GT3x+ accelerometer on a belt around the waist and positioned on the right hip for 24 hours/day for seven consecutive days. Participants were also asked to write in an activity diary the days of the week they wore the accelerometer, the times each day that they (i) got out of bed in the morning and went to bed at night, and (ii) took off the accelerometer and put it back on. Participants were asked to indicate if they did any physical activity by ticking a box (yes), and then to write what the activity specifically was (e.g. swimming) and the start and finish time of the activity (e.g. 8.30-9.00am). Participants were also asked to write their sitting time each day using the same items from the sitting time questionnaire (which assessed usual week).

Measures

Participant engagement included counts of the number of people who were eligible, invited, consented and provided data. Non-completion rates for both the questionnaires and accelerometer components were calculated. Reasons for study component non-completion that were verbally volunteered from the participants were noted.

Accelerometer wear time: Adherence to the accelerometer wear time protocol was assessed using participants' day hours, as defined by their self-reported time out of bed in the morning and time to bed at night. Adherence was defined as wearing the monitor for at least 10 hours/day [159] on four days of the week, including at least one weekend day [160]. Accelerometer non-wear time was identified from participants' self-report in the activity diaries and from accelerometer data of consecutive zero counts for 60 minutes or longer[161]. Average daily accelerometer wear time hours for participants who met the accelerometer wear time protocol were also calculated.

Ease/difficulty of completing study components: Participants were asked to rate the ease/difficulty of completing: (i) the 7-day recall physical activity questionnaire, (ii) the 7-day recall domain specific sitting questionnaire; and for those who completed the accelerometer and activity diary components: (iii) wearing the accelerometer during the day, (iv) wearing the accelerometer at night while sleeping, (v) completing the activity diary; (vi) recording accelerometer on and off times; (vii) recording the times they engaged in physical activity and (viii) recording their domain specific daily sitting time. Responses were recorded using a 10-point Likert scale with higher numbers indicating greater difficulty.

Extreme values of physical activity and sedentary behavior questionnaire data: The number of participants and questionnaire items with extreme values were identified. Extreme values for each physical activity domain were defined as values greater than 840 minutes (14hrs/week); and for total moderate-vigorous physical activity (MVPA) times as greater than 1680 minutes (28 hours/week) [154]. Total MVPA was calculated in weighted minutes/week by adding time in walking for transport, walking for recreation and exercise, moderate- and vigorous- intensity activity, with vigorous activity weighted by two to allow for its greater intensity. Extreme values for selected sedentary behavior domains were based on the authors' knowledge of the hospital routine: time spent in art therapy groups and with a health professional were each >5 hours/day and time spent in psycho-education groups was >3 hours/day. Other maximum values were based on logistics: time spent doing nothing was >12 hours/day; time spent watching television, using a computer, smoking and relaxing were each >10 hours/day. Total daily sedentary behavior was derived by summing times across the 10 domains, and extreme values defined as >1020 minutes (17 hours/day).

Psychological distress: Responses were summed across items. A score of 6-18 was used to indicate low to moderate psychological distress and 19-30 high psychological distress [157].

Data Analysis

Ease/difficulty ratings were collapsed into easy (rating of 1-3), moderate (rating of 4-6) and hard (rating of 7-10). Due to the non-normality of the data for the ease/difficulty ratings, non-parametric statistical tests were used. Wilcoxon sign rank tests were used to compare the ease/difficultly ratings within participants (i) between the physical activity and sitting time questionnaire and then between each of the accelerometer and diary components, and (ii) for all study components for participants who completed the questionnaires, accelerometer and activity diary. Mann-Whitney U tests were used to compare ease/difficulty ratings by level of distress for each of the study components. Given the number of comparisons assessed, a conservative alpha of p=<0.01 was arbitrarily set to test for statistical significance.

The proportions of participants who engaged in each of the study components, adhered to the accelerometer protocol and who were identified as providing extreme self-reported data values were calculated. Actigraph software was used to determine the average daily accelerometer wear time hours and non-wear time as consecutive zero counts for 60 minutes or longer. The cut-point criteria used were 0-99 counts per minute for sedentary activity, 2020-5998 for moderate activity and 5999 or greater for vigorous activity [161]. Moderate- and vigorous- intensity activity were combined and time spent in sedentary, light and MVPA were calculated as average minutes/day. Statistical tests were conducted using SPSS version 22.

2.4 Results

Participants' summary demographic characteristics are presented in Table 2-1 and participant engagement is presented in Figure 2-1. During the two recruitment periods, 276 patients were eligible for this study. Of these, 99 (36%) could not be contacted at the time of recruitment due to e.g. appointments with health professionals or being on leave from the hospital. Of the 177 participants who were invited, 118 (67%) consented to participate in the study; all consented to the questionnaires and 50 (42%) consented to the accelerometry and activity diary component. Of these consenting participants, 101 (86%) completed the questionnaires and 38 (76%) completed the accelerometry and activity diary.

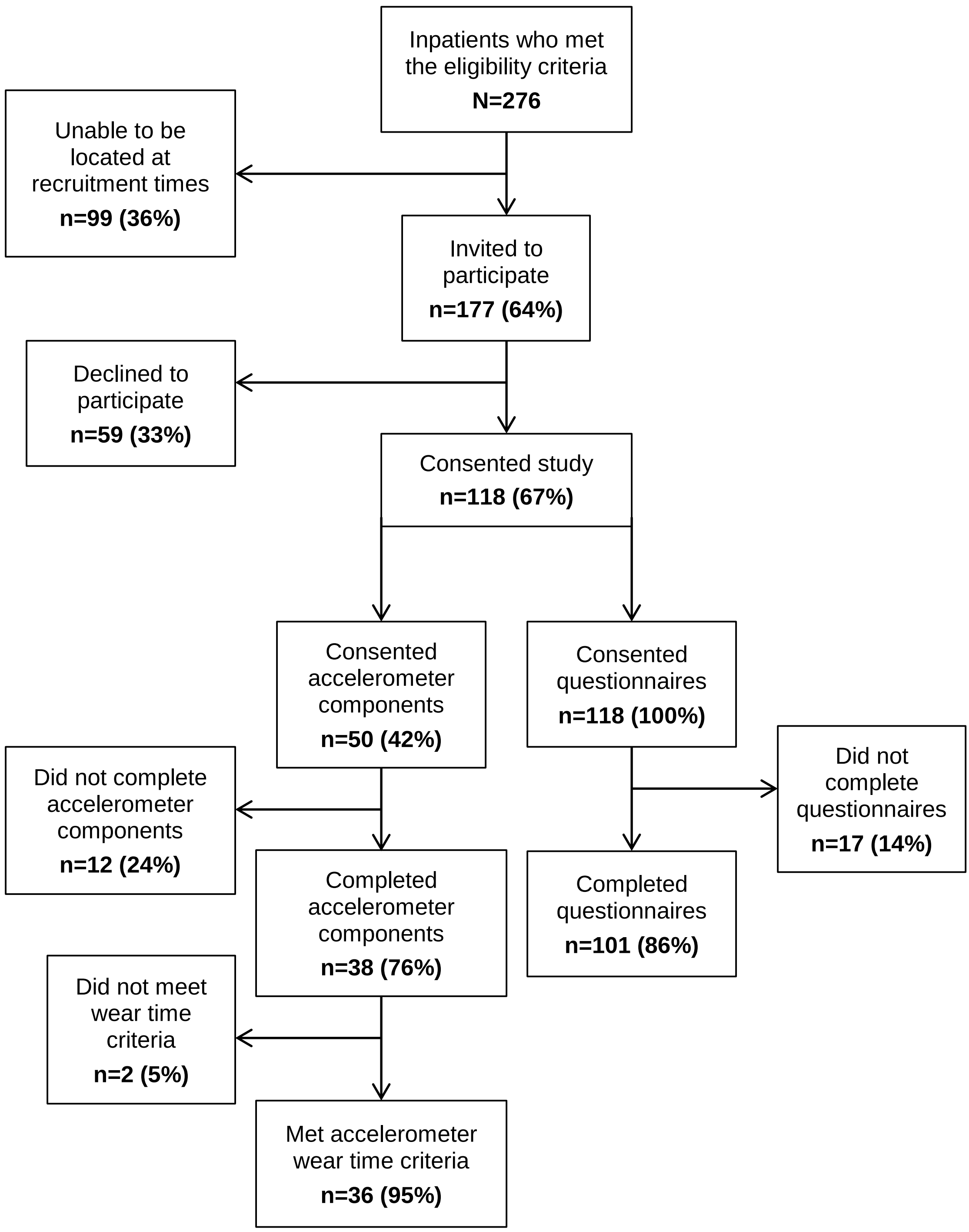

Figure 2-1: Participant Flow Chart

Table 2-1

Sociodemographic and health characteristics of participants

	Accelerometer n=36	**Questionnaires n=101**
Mean (SD) Age (years)	42.5 (13.6)	40.7 (14.5)
	n (%)	n (%)
Gender		
Male	6 (16.7)	28 (27.7)
Female	30 (83.3)	73 (72.3)
Country of birth		
Australia	32 (88.9)	86 (85.1)
Other	4 (11.1)	15 (14.9)
Household composition		
Single living alone	7 (19.4)	17 (16.8)
Single living with others/children	8 (22.2)	29 (28.7)
Couple without children	10 (27.8)	27 (26.7)
Couple with children	11 (30.6)	27 (26.7)
Missing data	0 (0-0)	1 (1.0)
Employment situation		
Not working [a]	10 (27.8)	27 (26.7)
Pensioner on benefits (not old age)	10 (27.8)	27 (26.7)
Working without pay	0 (0.0)	4 (4.0)
Paid part time/casual work	6 (16.7)	21 (20.8)
Full time paid employment	10 (27.8)	21 (20.8)
Missing data	0 (0-0)	1 (1.0)
Ability to manage on available income		
Impossible/Difficult all the time	14 (38.9)	29 (28.7)
Difficult some of the time	10 (27.8)	39 (38.6)
Not too bad	9 (25.0)	22 (21.8)
Easy	3 (8.3)	10 (9.9)
Missing data	0 (0-0)	1 (1.0)
Education		
School only	10 (27.8)	35 (34.7)
Trade certificate/Diploma	10 (27.8)	25 (24.8)
Bachelor/Post-graduate Degree	16 (44.4)	41 (40.6)

Psychological Distress [b]		
Low–Moderate (6-18)	11 (30.6)	28 (27.7)
High (19-30)	24 (66.7)	69 (68.3)
Missing	1 (2.8)	4 (4.0)
Physical health		
Poor	12 (33.3)	28 (27.7)
Fair	16 (44.4)	43 (42.6)
Good	5 (13.9)	18 (17.8)
Very Good / Excellent	3 (8.3)	12 (11.0)
Body Mass index (kg/m^2) [c]		
<18.5	0 (0-0)	2 (2.0)
18.5-24.9	9 (25.0)	26 (25.7)
25-29.9	10 (27.8)	27 (26.7)
30-39.9	12 (33.3)	33 (32.7)
>40	4 (11.1)	11 (10.9)
Missing data	1 (2.8)	2 (2.0)
Diagnosis [c, d]		
Depression	27 (75.0)	62 (61.4)
Anxiety	1 (2.8)	6 (5.9)
Bipolar Affective Disorder	6 (16.7)	19 (18.8)
Psychosis [e]	2 (5.6)	11 (11.0)
Post Traumatic Stress Disorder	5 (13.9)	12 (11.9)
Other [f]	1 (2.8)	7 (7.0)

Notes

[a] Not working: Looking for employment, full time house keeping, retired, studying

[b] Psychological distress derived from the Kessler 6

[c] Data retrieved from participant's medical records

[d] Diagnosis: It is noted that some participants had more than one primary diagnosis.

[e] Psychosis: Schizophrenia, Schizoaffective Disorder; Psychotic Disorder

[f] Other: Obsessive Compulsive Disorder; Eating Disorder; Personality Disorder

Non-completion was lower for the questionnaires (14%) than the accelerometer (24%) data collection. Reasons for participants not completing the questionnaires included early discharge from the hospital (n=10) and poor mental health (n=6). One participant lost the questionnaire and declined to complete another. Participants who did not complete the accelerometer and activity diary component were either discharged early from hospital (n=4), had poor mental health and found the components too burdensome (n=5) or forgot to wear the accelerometer (n=3).

Of the 38 participants who completed the accelerometer and activity diary component, 36 (95%) met accelerometer wear time criteria and 21 (58%) had 7 out of 7 valid days of monitoring. The two participants who did not meet wear time criteria, did not have any valid weekend day data. Of the participants who did meet accelerometer wear time criteria, the average wear-time for all valid days during waking hours was 13.6 hours and 32 (89%) participants wore the accelerometer for one or more nights.

An overview of participants' summary ease/difficulty ratings for completing the questionnaire items, wearing the accelerometer and completing the activity diary are presented in Table 2-2. Participants found it significantly more difficult to complete the sitting time questionnaire that asked about usual weekday and weekend day sitting time during the *last week* than the physical activity questionnaire ($z=5.872$, $p<0.001$), wearing the accelerometer during waking hours ($z=3.787$, $p<0.001$) and completing the activity diary ($z=2.724$, $p=0.006$). For participants who completed all study components (questionnaires, accelerometer and activity diary), there was no significant difference between the ease/difficulty rating for the previous week recall sitting questionnaire and the day-to-day recall sitting question in the activity diary. Participants found it more difficult to complete the physical activity questionnaire than to wear the accelerometer during waking hours ($z=2.824$, $p=0.005$). Participants also found it more difficult to complete the activity diary than to wear the accelerometer during waking hours ($z=3.083$, $p=0.002$). No significant difference was found between ratings of ease/difficulty and wearing the accelerometer during the day and wearing it during the night ($z=1.170$, $p=0.242$).

There were no statistically significant differences found when comparing the ease/difficulty ratings between participants with low-moderate distress and those with high distress for any of the study components: (i) 7-day recall physical activity questionnaire ($u=815.5$, $p=0.226$, $r=0.123$); (ii) 7-day recall domain specific sitting questionnaire ($u=1{,}094.0$, $p=0.97$, $r=0.170$); (iii) wearing the accelerometer during

Table 2-2

Participant ratings of ease/difficulty for completing study components

	Ease/Difficulty Ratings (Scale 1-10) n (%) for all participants				Ease/Difficulty Ratings by Distress median (25th, 75th percentile)		
	Easy (1-3)	**Moderate** (4-6)	**Hard** (7-10)	**Missing Data**	**All**	**Low-Moderate** (6-18)	**High** (19-30)
Questionnaire			**n=101**		**n=95-97[1]**	**n=26-28[1]**	**n=69**
Physical activity	49 (48.5)	20 (19.8)	31 (30.7)	1 (1.0)	4 (2, 7)	5 (2.25, 7)	3 (1.5, 7)
Sitting	21 (20.8)	17 (16.8)	61 (60.4)	2 (2.0)	7 (5, 9)	6.5 (3, 8.25)	8 (5, 9.5)
Accelerometer			**n=36**		**n=28-31[1]**	**n=7-9[1]**	**n=21-22[1]**
Wear during the day	24 (66.7)	3 (8.3)	4 (11.1)	5 (13.9)	2 (1, 3)	1 (1, 1.5)	2 (1, 5)
Wear while sleeping	23 (63.9)	2 (5.6)	3 (8.3)	8 (22.2)	1 (1, 2)	1 (1, 2)	1 (1, 2.5)
Activity Diary			**n=36**		**n = 30–31[1]**	**n=10**	**n=20–21[1]**
Complete diary	14 (38.9)	7 (19.4)	10 (27.8)	5 (13.9)	5 (2, 7)	4.5 (2.75, 6.5)	6 (1, 7.5)
Record accelerometer on/off time	18 (50.0)	10 (27.8)	3 (8.3)	5 (13.9)	3 (1, 5)	2.5 (1.75, 4)	3 (1, 5)
Record physical activity time	17 (47.2)	8 (22.2)	5 (13.9)	6 (16.7)	2.5 (1, 6)	2.5 (1, 4.75)	2.5 (1, 6)
Record sitting time	8 (22.2)	7 (19.4)	16 (44.4)	5 (13.9)	7 (3, 8)	4.5 (2, 8.25)	7 (4, 8.5)

Notes

[1] Variation in sample size due to missing data

the day (u=139.0, p=0.086, r=0.335); (iv) wearing the accelerometer at night while sleeping (u=80.0, p=0.756, r=0.77); (v) completing the activity diary (u=98.5, p=0.787, r=0.05); (vi) recording accelerometer on and off times (u=121.0, p=0.519, r=0.123); (vii) recording times they engaged in physical activity (u=104.5, p=0.846, r=0.037) and (viii) recording domain specific sitting (u=130.0, p=0.306, r=0.191).

For questionnaire physical activity data, extreme values were identified for 3 (3%) of the participants. Less than 2% of extreme values were identified for walking for transport and for vigorous-intensity activity. For weekday and weekend day sitting times, 6 (6%) participants were unable to answer the question, and of those who provided data (n=95), extreme values were found for 26 (27%). More extreme values were identified for attending psycho-education groups (18%) than any other sitting time domain (<7% each).

Questionnaire data indicated median of 32 minutes/day (IQR: 14.46-85.71) in weighted MVPA and a median of 761 minutes/day (12.7 hours) (IQR: 552.43-917.14) in sedentary behaviour. Accelerometry data indicated that participants spent an average of 37 minutes/day in MVPA and 664 minutes/day (11.1 hours) in sedentary behaviour.

2.5 Discussion

Participant recruitment and engagement for this study indicates that it is feasible to assess physical activity and sedentary behavior research among inpatient adults with mental illness using subjective or objective methods of data collection. Two thirds of invited participants provided consent, with a high proportion (86%) completing the self-report questionnaires. However, fewer than half (42%) agreed to the accelerometry and activity diary component of the study. This may be because inpatient adults with mental illness have a higher familiarity with filling out questionnaires, which are a common form of mental health status assessment. In contrast, accelerometers are unfamiliar to many people, and may be viewed with suspicion given the lack of understandable or visible data (unlike e.g. pedometers). One of the main reasons provided by participants who did not complete the study components was poor mental health and finding the assessment measures too burdensome. This is an inherent problem with this population, just as it is when conducting research working with people in poor physical health. Implications regarding representativeness can arise however, if people with poorer mental health self-select out of the study.

Of those participants who engaged in and completed the accelerometry component of the study (76%), a very high proportion (95%) adhered to the wear time protocol of at least ten hours per day for four days. This finding is consistent with our previous research which indicated that 88% of 97 adults with mental illness living in the community adhered to the same accelerometer wear time protocol [89]. This adherence rate among inpatient adults with mental illness is considerably higher than that observed in general population studies with the same wear time criteria. For example, a Swedish study of 1,448 free living adults had 77% adherence [162], and a Hong Kong study of 3601 free living adults had 60% adherence [163]. The high adherence rate in our study may reflect aspects of the accelerometer protocol, such as providing written and verbal instructions on how to wear the accelerometer, daily logs and verbal reminders which have been shown to increase adherence in other populations [90,164]. It may also be because while in hospital, inpatients are in a structured and supported environment and have had a change to competing time demands, for example, work attendance, caregiving and housework.

Ease/difficulty ratings results indicated that participants with high distress were no more likely to find study components difficult than participants with low-moderate distress. This contrasts our study of adults with mental illness living in the community (N=142), where participants with high distress had greater difficultly than those with low distress to report physical activity and sedentary behaviour [89]. There was no significant difference between the ease/difficulty of reporting sitting time over the last week and recording day-to-day sitting time. Participants however, found it more difficult to report domain specific sitting time over the last week than physical activity over the same time period which is consistent with our findings of adults with mental illness living in the community [89]. This may be due to the high levels of sedentary behavior in this population [96,100] and that physical activity is more discretely defined and therefore easier to recall than sedentary behavior. This was also reflected in the reporting of extreme values for the sitting time questionnaire in which six participants were unable to answer the questionnaire and of those who did, extreme values were reported by a quarter of participants. For assessment of sitting time, it may therefore be more feasible to use objective measures of sitting time behavior such as accelerometers.

Participants found it significantly more difficult to complete both the physical activity and sitting time questionnaire than to wear the accelerometer during waking hours. This again, is consistent with the findings our study of adults with mental illness living in the community [89]. Given the initial low consent rates to the accelerometer, it would therefore be beneficial to highlight the ease of wearing the accelerometer over completing questionnaires and to identify and problem solve any concerns when recruiting participants for future research. It should be noted however, that questionnaires are advantageous in that they provide more descriptive information regarding context. Given the participants' difficulties of completing the full activity diary, a further recommendation for future research would be to use simplified logs to record accelerometer on and off times. This would still prompt participants to wear their accelerometer, which is an important component of encouraging adherence [90,164].

The questionnaire and accelerometry results for overall time spent in MVPA were comparable, suggesting that both methods of assessment are feasible. However, direct comparisons of the two methods of assessment were unable to be made as the self-report and objective assessment was not completed at the exact same time.

2.6 Methodological considerations

Our study was conducted in one private psychiatric hospital, and the majority of the participants had depression. The study sample was not random, not all eligible patients were available to be invited to participate and of those who were invited and consented, not all completed the assessment. There was also a potential for response bias as the study recruitment protocol relied on volunteers, which meant that patients who had no interest in physical activity, or those who had poorer mental health, but still met the inclusion criteria, might not have participated. Also, patients who were unable to be located, due to leave from the hospital at the time of recruitment, were not included in the study. Given these issues, caution should therefore be used in generalizing the results to all mental health inpatients and across all mental illnesses.

Our study components included the use of a waist worn accelerometer, a specific accelerometer wear time protocol (10 hours/day, >4 days/week including a weekend day) and one specific type each of a physical activity (past week recall of each of walking, moderate and vigorous intensity activity) and sitting time (past week recall of travelling to and from places, at work, watching television, using a computer, leisure time, psycho-education group, art therapy group, with a health professional, smoking and doing nothing) questionnaire. It may be, that if different methods of objective measurement (e.g. wrist worn accelerometers) or questionnaires (e.g. different recall periods or non domain specific) were used, the feasibility results may have differed. It is important therefore, not to generalize these results to all methods of physical activity and sitting time measurement. As this was a cross sectional study, participants only completed the assessment once: the feasibility of data collection across multiple time points, such as for longitudinal and intervention studies, remain unclear.

2.7 Conclusions

The results of this study suggest that it is feasible to conduct physical activity and sedentary behavior research using questionnaires and accelerometers among inpatient adults with mental illness. Participants may be less likely to consent to accelerometry than questionnaires, although accelerometers are a more feasible measure of physical activity and sitting time than self-report questionnaires. The difficulty participants had in recording daily and past week sitting times suggest a need for researchers to explore alternative or assistance for self report measures of sedentary behaviour for this population. The information from this study highlights the need for clinicians and researchers to emphasize the benefits of using accelerometers as a measure of physical activity and sedentary behavior when recruiting participants. Researchers could also consider using simplified logs to report accelerometer on/off times as opposed to lengthy activity diaries.

2.8 Acknowledgments

This study was supported by Toowong Private Hospital, Brisbane, Australia, which provided gatekeeper approval to access to their inpatient population.

CHAPTER 3: Physical activity and sedentary behaviour among inpatient adults with mental illness

As discussed in Chapter 1, there is research evidence to suggest that adults with mental illness are interested in doing and can engage in physical activity. Previous research regarding whether or not adults with mental illness are meeting physical activity guidelines have primarily been conducted among adults who reside in the community, and provide mixed results (35-65% of participants meeting guidelines). Previous research also suggests that adults with mental illness spend a significant amount of time in sedentary behaviour, with studies indicating times ranging from 6.65 to 13.5 hours/day. Little research however, has explored different categories of physical activity and sedentary behaviour, and purposively assessed behaviour among inpatient adults with mental illness.

In comparison to adults with mental illness who reside in the community, the inpatient experience may influence physical activity and sedentary behaviour due to e.g. the impact of the hospital environment and a change in competing time demands. The purpose of this study was therefore, to examine physical activity and sedentary behaviour among inpatients. Detailed information on physical activity across categories (i.e. walking for transport, walking for recreation, gardening activity, moderate- and vigorous-intensity) and sedentary behaviour across contexts (e.g. watching television, using a computer, therapy groups) was collected. To help identify potential priority patient groups for such interventions and the need for tailored strategies, physical activity and sedentary behaviour were examined by age, gender, education, body mass index and psychological distress. The outcomes of this research can inform the development of hospital based interventions - time spent in hospital is an opportunity to establish adaptive self-management practices associated with physical activity and sedentary behaviour that can then be continued out of hospital.

This study has been published (online ahead of print) in the Journal of Science and Medicine in Sports (Impact Factor 3.194).

The citation is as follows:

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3.1 Abstract

Objectives: The aim of this study was to assess levels and patterns of physical activity and sedentary behaviour among inpatient adults with mental illness.

Design: Cross-sectional

Methods: 101 participants completed questionnaires on time spent in walking, moderate- and vigorous- intensity activity in the past week and domain specific sitting time on a usual weekday and weekend day. 36 participants also provided valid accelerometry data. Regression analyses were used to explore associations between MVPA and sedentary behaviour and explanatory variables of gender, age, education, body mass index and psychological distress.

Results: Self-report data indicated median of 32 minutes/day (IQR: 14.46–85.71) in weighted MVPA and a median of 761 minutes/day (12.7 hours) (IQR: 552.43–917.14) in sedentary behaviour. Accelerometry data indicated an average of 115 minutes/day in light activity, 37 minutes/day in MVPA and 664 minutes/day (11.1 hours) in sedentary behaviour. Bivariate analyses indicated no significant associations between explanatory variables and MVPA and sedentary behaviour.

Conclusions: Inpatient adults with mental illness can be physically active, with walking comprising the major component of MVPA time. Inpatient adults with mental illness spend a significant amount of time sitting; intervention strategies could focus on reducing the time spent sitting in general relaxation and doing nothing.

3.2 Introduction

The life expectancy of adults with mental illness is worse than that of the general population and is largely due to poor physical health status [13,15] including obesity, type two diabetes mellitus, hypertension, dyslipidemia and cardiovascular disease [23,26]. Low levels of physical activity [151,152] and high levels of sedentary behaviour [165,166] may contribute to these poor health outcomes and reduced life expectancy [13].

Studies on physical activity and sedentary behaviour of adults with mental illness have predominantly been carried out in community settings [95-97] or subsumed in population-based surveys [94]. One Australian survey reported that 64.5% of a sample of 1,825 people with psychoses were active [94], and another reported that 49% of 150 adults with schizophrenia achieved >150 minutes of physical activity, with 44% of these achieving at least five sessions [97]. However, data from the 2007-2008 Health Survey of Australia indicated that adults who had high or very high levels of psychological distress were less likely to achieve at least 150 minutes/week of moderate intensity activity than those with lower levels of distress [98]. Accelerometer data from 60 outpatient adults with bipolar disorder found that participants averaged 14 minutes per day in moderate-vigorous physical activity (MVPA) and 13.5 hours/day in sedentary behaviour [96]. Another study concluded that 35% of 55 overweight/obese adults with severe mental illness did ≥150 minutes/week of MVPA, and the average time spent in MVPA was 120 minutes/week [104]. Studies of adults with mental illness suggest lower rates of activity among females, and those with low education and high BMI [95,167,168]; and higher rates of sedentary behaviour among those with high BMI [169].

Little research has purposively assessed physical activity and sedentary behaviour patterns among *inpatient* adults with mental illness. The inpatient experience may influence behaviour due to e.g. the impact of the hospital environment and a change in competing time demands. Time spent in hospital is an opportunity to establish adaptive self-management practices that can then be continued out of hospital. To inform hospital-based interventions, we need to understand levels and patterns of behaviour. The aim of this study therefore, was to assess levels and patterns of physical activity and sedentary behaviour among inpatient adults with mental illness.

3.3 Methods

This was a cross-sectional study. Participants were inpatient adults (18-75 years; N=101) with mental illness recruited in two waves over an eight-month period from a private psychiatric hospital in Brisbane, Australia. The hospital's daily inpatient census was reviewed weekly by the lead author and the charge nurse to exclude patients who did not meet the following eligibility criteria: (i) psychiatric diagnosis as defined by the Diagnostic and Statistical Manual of Mental Disorders, 5th Edition; (ii) not experiencing acute psychiatric symptoms; (iii) not acutely suicidal; (iv) not under an involuntary treatment order. Eligible patients were verbally invited to participate at least five days after admission, to allow time to settle into the hospital. Ethical clearance was awarded by The University of Queensland Human Research Ethics Committee (2014000420).

Self-reported physical activity was assessed using a modified version of the Active Australia survey [154]. Items assessed the frequency of and total time spent walking for transport, walking for recreation and leisure, and in moderate and vigorous intensity activity during the previous week. The Active Australia survey has been used in National and state surveys [154,155] and has acceptable psychometric data with reliability coefficients ranging from 0.56-0.64 for each domain of activity [170].

Self-reported sedentary behaviour was assessed using a modified version of a questionnaire which asks about time spent sitting on each of a usual weekday and weekend day in (i) travelling to and from places, (ii) at work, (iii) watching television, (iv) using a computer and (v) leisure time [156]. The questionnaire has high reliability for weekday sitting at work, watching television and using a computer (r = 0.84-0.78), but lower reliability for weekend days across all domains (r = 0.23-0.74). To reflect the inpatient setting, leisure time was replaced with general relaxing and five additional domains were added: (i) psycho-education group, (ii) art therapy group, (iii) with a health professional, (iv) smoking and (v) doing nothing.

Objective physical activity and sedentary behaviour were assessed using Actigraph GT3x+ accelerometers. Participants wore the accelerometer positioned on the right hip on a belt around the waist for 24 hours/day for seven consecutive days, and record in an activity diary the times (i) they got out of bed in the morning and went to bed at night and (ii) anytime they took off the accelerometer and the time they put it back on.

The Kessler (K6) scale [157] was used to assess psychological distress. It has been shown to have good reliability [158] and validity [157]. Responses were summed across items, which used a five point Likert scale. A score of 6–18 indicated low to moderate psychological distress and 19–30 high psychological distress [157].

Sociodemographic variables were assessed using standard questionnaire items. Variables included gender, age, household composition, employment status and education. Data on weight and height (used to derive body mass index) and diagnosis were retrieved from participants' medical records. As participants could be assigned multiple diagnoses, each diagnosis was recorded.

Self-reported physical activity data were included in the analysis if duration was available for at least one questionnaire item. To avoid potential over-reporting, reported times greater than 840 minutes (14hrs/week) for a single activity type were truncated at 840 minutes [154]. Total self-report MVPA was calculated in weighted minutes/week by adding time in walking for transport, walking for recreation and exercise, moderate- and vigorous- intensity activity, with vigorous activity weighted by two to allow for its greater intensity. To further avoid potential over-reporting, total MVPA times that were recorded as greater than 1680 minutes (28 hours/week) were truncated at 1680 minutes [154].

Self-reported sedentary behaviour data were included in the analysis if reported duration was available for at least one questionnaire item. Based on the authors' knowledge of the hospital routine, times were truncated to 12 hours/day for doing nothing; 10 hours/day for each of time spent watching television, using a computer, smoking and relaxing; 5 hours/day for each of art therapy groups and with a health professional and 3 hours/day for psycho-education groups. Total daily sedentary behaviour was derived by summing times across the 10 domains and to further avoid potential over-reporting, times greater than 1020 minutes (17 hours/day) were truncated to 1020 minutes/day. Average daily sedentary behaviour was calculated by multiplying the weekday sitting total by five and the weekend sitting total by two, then adding the two sums together and dividing by seven.

Actigraph software was used to analyse the data retrieved from the GT3x+ accelerometers. Participants' day hours were defined by self-reported time out of bed in the morning and time to bed at night. Data were considered valid if the monitor was worn for at least 10 day hours/day [159] on four days of the week, including at least one weekend day [160]. Accelerometer non-wear time was identified from participants' activity diaries and from consecutive zero counts for 60 minutes or longer. The cut-point criteria used were 0–99 counts per minute for sedentary activity, 100–2019 for light activity, 2020–5998 for moderate activity and 5999 or greater for vigorous activity [161]. Moderate and vigorous activity were combined and time spent in sedentary, light and MVPA were calculated as average minutes/day.

Five explanatory variables were considered to identify potential correlates of self-reported MVPA and sedentary behaviour, including: gender and education (categorical measures); and age, body mass index and psychological distress (continuous measures). Linear regression was used to assess bivariate associations between MVPA/sedentary behaviour and each of the five explanatory variables. Variables found to be associated at $p<0.10$ at the bivariate level were to be considered for multivariable analysis. Analyses were conducted using SPSS version 22.

3.4 Results

During the recruitment, 276 patients were eligible for this study. Of these, 99 (36%) could not be contacted due to e.g. appointments with health professionals or being on leave from the hospital. This resulted in 177 (64%) patients being invited to participate. Of those invited, 118 (67%) consented to participate in the survey and 101 (57%) provided data; and 50 (28%) consented to participate in the accelerometry and 38 (21%) provided data, with 36 (95%) meeting the accelerometer wear time criteria[159]. Reasons for survey non-completion included early discharge from the hospital (n=10) and poor mental health (n=6). One participant lost the survey and declined to complete another. Reasons for accelerometry non-completion included poor mental health (n=5), early discharge from hospital (n=4) and forgetting to wear the accelerometer (n=3).

For self report activity data, scores were truncated for 3 (3%) of the participants, with extreme values identified for walking for transport (n=1) and vigorous intensity activity (n=2). For self-report sitting times, 6 (6%) participants gave no data as they found it too difficult, and of those who provided data (n=95), scores were truncated for 26 (27%) participants. The proportion of participants with extreme sitting time values was higher for attending psycho-education groups (18%) than other domains (<7% each).

Participants’ demographic characteristics are summarised in Table 3-1. The mean age was 40.7 years (SD 14.5) and 72% were female. The majority (61%) had a depressive disorder and 68% had a high level of psychological distress.

Self-report data indicated a median of 32 weighted minutes/day (IQR: 14.46-85.71) in MVPA and a median of 761 minutes/day (12.7 hours) (IQR: 552.43–917.14) in sedentary behaviour. Accelerometry data indicated an average of 115 minutes/day in light activity, 37 minutes/day in MVPA and 664 minutes/day (11.1 hours) in sedentary behaviour.

Table 3-1

Sociodemographic and health characteristics of participants

	Accelerometer n = 36	**Survey n = 101**
Mean (SD) Age (years)	42.5 (13.6)	40.7 (14.5)
	n (%)	n (%)
Gender		
Female	30 (83.3)	73 (72.3)
Country of birth		
Australia	32 (88.9)	86 (85.1)
Household composition		
Single living alone	7 (19.4)	17 (16.8)
Single living with others / children	8 (22.2)	29 (28.7)
Couple without children	10 (27.8)	27 (26.7)
Couple with children	11 (30.6)	27 (26.7)
Employment situation		
Not working [a]	10 (27.8)	31 (30.7)
Pensioner on benefits (not old age)	10 (27.8)	27 (26.7)
Paid part time / casual work	6 (16.7)	21 (20.8)
Full time paid employment	10 (27.8)	21 (20.8)
Ability to manage on available income		

Impossible / Difficult all the time	14 (38.9)	29 (28.7)
Difficult some of the time	10 (27.8)	39 (38.6)
Not too bad	9 (25.0)	22 (21.8)
Easy	3 (8.3)	10 (9.9)
Education		
School only	10 (27.8)	35 (34.7)
Trade certificate / Diploma	10 (27.8)	25 (24.8)
Bachelor / Post-graduate Degree	16 (44.4)	41 (40.6)
Psychological Distress [b]		
Low – Moderate (6 – 18)	11 (30.6)	28 (27.7)
High (19 – 30)	24 (66.7)	69 (68.3)
Physical health		
Poor	12 (33.3)	28 (27.7)
Fair	16 (44.4)	43 (42.6)
Good	5 (13.9)	18 (17.8)
Very Good / Excellent	3 (8.3)	12 (11.0)
Body Mass index (kg/m^2) [c]		
< 18.5	0 (0 – 0)	2 (2.0)
18.5 – 24.9	9 (25.0)	26 (25.7)
25 – 29.9	10 (27.8)	27 (26.7)
> 30	16 (44.4)	44 (43.6)
Diagnosis [c, d]		
Depression	27 (75.0)	62 (61.4)
Anxiety	1 (2.8)	6 (5.9)
Bipolar Affective Disorder	6 (16.7)	19 (18.8)
Psychosis [e]	2 (5.6)	11 (11.0)
Post Traumatic Stress Disorder	5 (13.9)	12 (11.9)
Other [f]	1 (2.8)	7 (7.0)

Notes

[a] Not working: Looking for employment, full time house keeping, retired, studying, volunteer

[b] Psychological distress derived from the Kessler 6

[c] Data retrieved from participant's medical records

[d] Diagnosis: It is noted that some participants had more than one primary diagnosis.

[e] Psychosis: Schizophrenia, Schizoaffective Disorder; Psychotic Disorder

[f] Other: Obsessive Compulsive Disorder; Eating Disorder; Personality Disorder

Self-reported time spent in physical activity is summarised in Table 3-2. There was wide variation in time spent walking with a median of 60 minutes/week in each of walking for transport (IQR: 10.0–131.25) and walking for recreation and exercise (IQR: 0–150). Walking accounted for the majority of physical activity sessions, with one quarter of participants reporting five or more sessions/week of walking for transport, and about one third reported five or more sessions/week of walking for recreation. Median values for moderate and vigorous activity were zero. Approximately 75% of participants reported no sessions of moderate-intensity activity, and approximately half reported no sessions of vigorous-intensity activity. There was also wide variation in weighted MVPA time with a median of 225 minutes/week (IQR: 101.25–600). Overall, 65% of participants who provided self-report data met guidelines of at least 150 minutes/week of MVPA [92].

Table 3-2

Domain specific self-reported physical activity duration (minutes/week) N=101

	Median (IQR)
Walking for transport	60 (10.0 – 131.25)
Walking for recreation and exercise	60 (0 – 150)
Vigorous gardening and yard work	0 (0 – 0)
Vigorous physical activity	0 (0 – 60)
Moderate physical activity	0 (0 – 30)
Total self-reported moderate-vigorous physical activity [a]	225 (101.25 – 600)

Notes

Items reported as median (25^{th} 75^{th} percentile)

[a] Total physical activity excludes vigorous gardening and yard work, and has vigorous activity weighted by two.

Durations of self-reported sedentary behaviour are summarised in Table 3-3. The longest reported sitting times were doing nothing on both weekdays (median 120 minutes/day, IQR: 60–240) and weekend days (median 120 minutes/day, IQR: 60–240), and with a health professional (median 67.5 minutes/day, IQR 46.25–180) on a weekday. Data indicated a median total time of 13 hours/day in sedentary behaviour on weekdays and 10 hours/day in sedentary behaviour on weekend days.

Table 3-3

Domain specific self-reported sedentary behaviour duration (minutes/day) N=101

	Weekday Median (IQR)	Weekend Median (IQR)
Travelling to and from places	30 (0 -60)	30 (0 -60)
Watching television	60 (0 -180)	60 (0 -180)
Using a computer	30 (0 -120)	10 (0 – 120)
Psycho-education group	60 (0 – 120)	0 (-)
Art therapy group	0 (0 – 120)	0 (-)
With a health professional [a]	67.5 (46.25 – 180)	20 (0 – 30)
Smoking	0 (-)	0 (-)
General relaxing (sitting or lying) [b]	120 (60 – 240)	120 (30 – 240)
Doing work [c]	0 (0 – 60)	0 (0 – 60)
Doing nothing (sitting or lying)	120 (60 – 240)	120 (30 – 240)
Total sedentary behaviour time	780 (555 - 1020)	600 (405 - 825)

Notes

Items reported as median (25^{th} 75^{th} percentile)

[a] Doctor, Nurse, Psychologist, Social Worker or Occupational Therapist

[b] Example: reading, needle work (not watching television or using a computer)

[c] Example: homework, assignments, reading documents, writing NOT using a computer

Accelerometry results indicated that participants spent an average time of 11.2 hours/weekdays and 10.8 hours/weekend days in sedentary behaviour; 1.85 hours/weekdays and 2.1 hours/weekend days in light activity, and 38 minutes/weekdays and 34 minutes/weekend days in MVPA.

Bivariate analyses indicated no statistically significant associations between each of the explanatory variables and self-report MVPA (gender: β=-0.079, p=0.446; education: β=-0.050, p=0.632; age: β=0.019, p=0.856; BMI: β=-0.10, p=0.341 and psychological distress: β=0.022, p=0.632) or sedentary behaviour (gender: β=-0.041, p=0.717; education: β=0.037, p=0.748; age: β=0.073, p=0.523; BMI: β=0.088, p=0.445 and psychological distress: β=0.059, p=0.607). Multivariable analyses were therefore not conducted.

3.5 Discussion

This study indicates that adult inpatients with mental illness can be physically active, with 65% meeting the Australian Physical Activity Guidelines of at least 150 minutes per week [92] and a median of self-reported MVPA of 32 minutes/day (IQR: 14.46–85.71). This self-reported data was consistent with the accelerometry results, which indicated an average of 37 minutes/day in MVPA. Although our sample was predominantly comprised of people with depression, these results are consistent with one previous Australian study of people with psychosis living in the community which found that 65% were meeting guidelines [94].

Our findings however, contrast other research indicating that the majority of adults with mental illness are not meeting activity guidelines [96,97,104]. It may be that while in hospital, inpatients are in a structured and supported environment and have had a change to competing time demands, for example, work attendance. This would provide more discretionary time for MVPA. As participants were voluntary admissions, they were able to take leave, and it was observed that many people did so to walk to and around a nearby shopping mall to have a break from the hospital. In our study, walking comprised the majority of MVPA time, and few people engaged in other MVPA.

The results indicate that inpatient adults with mental illness have prolonged sitting time. Self-report data indicated a median of 761 minutes/day (12.7 hours) (IQR: 552.43–917.14) in sedentary behaviour, and accelerometry data indicated an average of 664 minutes/day (11.1 hours). These findings are similar to a previous accelerometry study of outpatient adults with bipolar disorder that found an average of 13.5 hours/day in sedentary behaviour [96]. However, another study of outpatient adults with schizophrenia spectrum disorders found an average of 6.75 hours/day in sedentary behaviour [103]. The different diagnoses of participants across studies may contribute to these study differences.

More time was spent in sedentary behaviour on weekdays than weekend days. Self-report data indicated a median time of 13 hours/weekdays and 10 hours/weekend days which was consistent with accelerometry results of an average of ~11 hours/weekdays and ~10 hours/weekend days. This could in part be attributed to the time spent with health professionals (median 67.5 minutes/day) and in psycho-education groups (median 60 minutes/day). Allied health professionals are more likely to work on weekdays and the hospital facilitates psycho-education groups only on weekdays. Participants spent a median of one hour on both weekdays and weekend days watching television. This is in contrast to general population based studies in which watching television is a common context for prolonged sedentary behaviour [47]. For example, one general population study indicated the average time spent watching television was 13 hours/week [93] which is almost double the time in our study. The short time spent watching television in our study may reflect the specific hospital setting; inpatients have limited access to television; and are obliged to either use a shared area or pay to have access to a television.

The main area of concern for this population in relation to sedentary behaviour is the time spent "doing nothing" on both weekdays and weekend days. While other hospitalized patients with physical conditions may have movement restrictions, a psychiatric population is typically ambulatory. There is a need therefore, to explore options for non-sedentary activities on both weekdays and weekend days for inpatients with mental illness.

There were no significant associations between explanatory variables of gender, education, age, BMI and psychological distress and MVPA and sedentary behaviour which contrasts other studies conducted among adults with mental illness [95,167-169]. This may reflect the inpatient environment, however more work however is needed to confirm this finding.

Caution should be used in generalizing the results to all mental health inpatients. Our study was conducted in one private psychiatric hospital, and the majority had depression as the primary diagnosis. Different results may have been obtained with a different mix of diagnoses, for example if there were more participants with schizophrenia. The study sample was not random, not all eligible patients were invited to participate, and not all of those who consented completed the assessment. There was a potential for response bias as the recruitment relied on volunteers; patients who had no interest in activity, or those who had worse mental health might not have been included. Patients who were unable to be located due to leave from the hospital during recruitment were not included. In order to minimize participant burden and to respect privacy, data on severity of diagnosis and length of stay in hospital were not included, and so cannot be reported. As self-report and objective assessment was not conducted at the exact same time, we are unable to directly compare methods of assessment. As there was no way to ascertain if participants walked or engaged in physical activity at a sufficient intensity to constitute MVPA, self-reported MVPA may be over-estimated and may not directly translate to MVPA as assessed by accelerometry. More work is needed therefore, to compare self-report and objective measures of MVPA and sedentary behaviour in people with mental illness.

3.6 Conclusions

The study suggests that inpatient adults with mental illness can be physically active, with many engaging in walking, in particular to have time away from the hospital environment. However they spend a significant amount of time sedentary. This is important as prolonged sedentary behaviour is associated with poor physical health and may contribute to reduced life expectancy, which are more common among adults with mental illness than in the general population. This study highlights the need for sedentary behaviour advice, recommendations and interventions for psychiatric inpatients, in particular to redress time spent doing nothing while in hospital.

3.7 Practical implications

- Inpatient adults can be physically active with 65% of this study population meeting the Australian Physical Activity Guidelines of at least 150 minutes per week.
- Walking is the most common type of activity.

- Inpatient adults with mental illness spend a significant amount of time sitting each day, often doing nothing.
- Hospitals could explore options for non-sedentary activities on both weekdays and weekend.

3.8 Acknowledgements

This study was supported by Toowong Private Hospital, Brisbane, Australia, who provided gatekeeper approval to access their inpatient population. No financial support was granted for this study.

CHAPTER 4: Physical activity attitudes and preferences among inpatient adults with mental illness

Results from Chapter 3 indicated that although 65% of inpatient adults with mental illness were meeting physical activity guidelines, there was little structured moderate- to vigorous-intensity physical activity. There is a need therefore for physical activity interventions for inpatient adults with mental illness. To guide the development of these interventions, there is a need to understand patient attitudes and preferences for doing physical activity in hospital. Interventions consistent with patient attitudes and preferences may be more appealing than generic strategies.

As discussed in Chapter 1, previous evidence suggests that adults with mental illness view physical activity as beneficial for both physical and mental health, e.g. in terms of improving energy levels, decreasing stress and improving sleep. Previous research suggests that adults with mental illness prefer walking and activities done at or close to home; and physical activity advice from a doctor and support from a trainer; and barriers of mental illness, sedative effects of medications, weight gain, low motivation and fatigue. These studies however, have all predominantly been conducted among adults with mental illness residing in the community. This study explored the attitudes towards, preferences for and barriers to doing physical activity among adults with mental illness *in a hospital setting*. The inpatient experience may influence preferences for how, where and sources of support to do physical activity. To identify the need for interventions tailored to patient groups, physical activity reasons, context preferences and barriers were examined by psychological distress and gender.

This study has been published in the *International Journal of Mental Health Nursing* (Impact Factor 1.950).

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4.1 Abstract

The life expectancy of adults with mental illness is worse than that of the general population and is largely due to poor physical health status. Physical activity has been consistently recommended for the prevention and management of many chronic physical health conditions and can also have benefits for mental health. This cross sectional study assessed the attitudes towards and preferences for physical activity among inpatient adults with mental illness, and differences by distress and gender. Self-report questionnaires were completed by 101 patients. Findings indicated that inpatient adults with mental illness are interested in doing physical activity while in hospital, primarily to maintain good physical health and improve emotional wellbeing. Fewer than half of participants agreed that physical activity has benefits for serious mental illness. Participants indicated a preference for walking and physical activity that can be done alone, at a fixed time and with a set routine and format. Major barriers were fatigue and lack of motivation. Females were more likely than males to prefer activities done with others of the same gender ($p=0.001$) and at the same level of ability ($p<0.001$). There were no significant differences by level of distress. These findings can inform physical activity intervention programming in hospital settings, which may contribute to decreasing the chronic disease burden and improve the psychological wellbeing in adults with mental illness.

4.2 Introduction

The life expectancy of adults with mental illness is significantly less than that of the general population [13]. This is largely due to poor physical health as adults with mental illness have an increased prevalence of metabolic risk factors including obesity, hypertension, dyslipidemia and insulin resistance; and conditions such as cardiovascular disease and type two diabetes mellitus [23,25,26]. Regular physical activity can have an integral role in the management of adults with mental illness. Physical activity has been consistently recommended for the prevention and management of many chronic conditions as it decreases the risk of cardiometabolic risk factors [171]. Physical activity also has an inverse relationship with poor mental health [53,56] with studies demonstrating treatment effects for depression [57] and anxiety disorders [61], and improvements in neuro-cognition, negative and positive symptomology and functional disability in adults with schizophrenia [55,68-70,172].

Recent reviews have examined the correlates of physical activity in adults with mental illness. Low levels of physical activity participation have been associated with negative body attitude in adults with binge eating disorder [173]; low self efficacy and medical co-morbidities in adults with bipolar disorder [167]; and negative symptomology, cardio-metabolic comorbidity, low self-efficacy and social isolation in adults with schizophrenia [168]. Community based studies on barriers to physical activity have indicated mental illness symptoms, weight gain, low motivation, fatigue, and sedative effects [112,114,174]. Studies on the physical activity preferences of adults with mental illness have suggested walking [95,113,114]; activities done at or close to home [109,113]; and for adults with psychological distress, activities that involve little or no cost, can be done alone, are done outdoors, are supervised and are done at fixed times with scheduled sessions [115]. In terms of sources of support, studies indicate that adults with mental illness prefer physical activity advice from a doctor [113,114]. One study concluded that male outpatient adults with mental illness were more likely to prefer team sports than women ($p < 0.0001$), but no other significant gender differences in preferences for and attitudes towards physical activity [114].

Research on the physical activity attitudes and preferences of adults with mental illness has predominantly been conducted among those living in the community and can be used to inform the development of outpatient programs. More work is needed however, to inform the development of physical activity programs for inpatients. The inpatient experience may influence preferences for how, where and sources of support to do physical activity. The aim of this study, therefore, was to determine the attitudes towards and preferences for physical activity among inpatient adults with mental illness. We also assessed if physical activity reasons, context preferences and barriers differed by psychological distress and gender.

4.3 Methods

This was a cross-sectional study. Participants (n=101) were inpatient adults recruited from a private psychiatric hospital. Recruitment was conducted in two waves over an eight-month period. The hospital's daily inpatient census was obtained weekly and discussed with the charge nurse to select patients who met the following eligibility criteria: (i) a psychiatric diagnosis as defined by the Diagnostic and Statistical manual of Mental Disorders, 5th Edition; (ii) not experiencing acute psychotic symptoms; (iii) not acutely suicidal; (iv) not under an involuntary treatment order. Eligible patients were invited to participate in the study at least five days after admission, to allow time for them to settle into the hospital. This study received ethical clearance by The University of Queensland Human Research Ethics Committee (2014000420). Written informed consent was obtained.

Data on weight and height (used to derive body mass index), blood pressure and diagnosis were retrieved from participants' medical records. Participants were asked to complete a self-administered written survey. Unless otherwise stated, participants indicated the extent to which they disagreed or agreed with items using a five point Likert scale (strongly disagree, disagree, unsure, agree and strongly agree).

Interest in physical activity: Participants were asked to indicate on a ten point Likert scale how interested they were in doing physical activity as an inpatient. A score of 1 – 3 indicated low interest, 4 – 6 moderate interest and 7 – 10 high interest.

Reasons to do physical activity: Perceived reasons to do physical activity were assessed using ten items that had previously been used in general population research [175] and four additional items relevant to inpatients adults with mental illness (to help improve my emotional wellbeing, to improve my energy levels, to help manage my pain and to help me sleep better).

General knowledge regarding the benefits of physical activity for managing a range of physical and psychological health conditions was assessed using an adapted version of a questionnaire from previous research conducted with mental health professionals [176] and medical staff. One item was removed, two items were modified and one item was added (post-traumatic stress disorder) to enhance the relevance for this inpatient setting.

Preferences for type, context and sources of support: Preferences for activity context were assessed using an adapted version of an 18-item questionnaire [108] which has previously been used with a psychologically distressed population [115]. Eight items were removed, one item was modified and three items were added (done in hospital, done out of hospital and done with people with mental illness) to enhance relevance for the inpatient setting. Participants were also asked to tick as many that applied to indicate which of 14 types of physical activities they would prefer to do while in hospital. Participants also indicated whom they would most prefer as an inpatient to (i) receive physical activity recommendations and advice from, (ii) design physical activity programs, and (iii) deliver physical activity programs. Response options were a personal trainer, gym instructor, general nurse, mental health nurse, doctor, exercise physiologist, physiotherapist or other.

Barriers were assessed using an adapted version of a 24-item questionnaire [175] previously used in general population research. Items were added to enhance applicability to an inpatient mental health population (feel too tired, lack of energy, lack of motivation, do not have the right clothes and feel unsafe to go outside). Participants were also given the option of ‘other’ to identify additional barriers.

Sociodemographic variables were assessed including gender, age, household composition, employment status and education. The Kessler (K6) scale [157] was used to assess psychological distress. It has been shown to have good reliability [158] and validity [157]. A score of 6 – 18 indicated low to moderate psychological distress and 19 – 30 high psychological distress [157].

Analyses were conducted using SPSS version 22. Due to the small cell sizes for some response options, responses were collapsed into categories of disagree, unsure and agree. Descriptive statistics were used to summarise the quantitative data. Pearson’s Chi-Square was used to assess differences by psychological distress and gender in reasons to do physical activity, physical activity context preferences and barriers to physical activity using the collapsed categories of agree and disagree. Fisher's exact test was applied when sample sizes were too small. Given the multiple comparisons conducted, a conservative p value of ≤ 0.003 was adopted.

4.4 Results

During the two recruitment periods, 758 patients were potentially available for this study of which 276 (36%) met the eligibility criteria. Of those eligible, 99 (36%) could not be contacted at the time of recruitment due to e.g. appointments with health professionals or being on leave from the hospital, resulting in 177 (64%) patients being invited to participate. Of the total patients eligible, 118 (43%) consented and of these 101(37%) provided data, which was 57% of those invited. Reasons for participants not completing the survey included early discharge from the hospital prior to survey completion (n = 10) and poor mental health (n = 6). One participant lost the survey and declined to complete another. Participants' demographic characteristics are summarised in Table 4-1.The mean age of the participants was 40.7 years (SD 2.3) and 72% were females. The most common diagnosis was a depressive disorder (61%) and 68% of participants had a high level of psychological distress.

Table 4-1

Sociodemographic and health characteristics of participants (N = 101)

Mean (SD) Age (years)	40.7 (14.5)	
	n	(%)
Age (years)		
18 – 24	17	16.8
25 – 34	22	21.8
35 – 44	20	19.8
45 – 54	24	23.8
55 – 64	11	10.9
65 – 74	7	6.9

Gender		
Male	28	27.7
Female	73	72.3
Country of birth		
Australia	86	85.1
Other	15	14.9
Household composition		
Single living alone	17	16.8
Single living with others	27	26.7
Single living with children	2	2.0
Couple without children	27	26.7
Couple with children	27	26.7
Missing data	1	1.0
Employment situation		
Not working - looking for employment	6	5.9
Not working - full time house keeping	7	6.9
Not working - retired	9	8.9
Not working - studying	5	5.0
Pensioner on benefits (not old age)	27	26.7
Working without pay	4	4.0
Paid part time / casual work	21	20.8
Full time paid employment	21	20.8
Missing data	1	1.0
Ability to manage on available income		
Impossible / Difficult all the time	29	28.7
Difficult some of the time	39	38.6
Not too bad	22	21.8
Easy	10	9.9
Missing data	1	1.0
Education		
School only	35	34.7
Trade certificate / apprenticeship	14	13.9
Diploma	11	10.9
Bachelor Degree	27	26.7
Post-graduate Degree	14	13.9

Psychological Distress [a]		
Low – Moderate (6 – 18)	28	27.7
High (19 – 30)	69	68.3
Missing	4	4.0
Physical health		
Poor	28	27.7
Fair	43	42.6
Good	18	17.8
Very Good / Excellent	12	11.0
Body Mass index (kg/m^2) [b]		
< 18.5	2	2.0
18.5 – 24.9	26	25.7
25 – 29.9	27	26.7
30 – 39.9	33	32.7
> 40	11	10.9
Missing data	2	2.0
Blood Pressure [b, c]		
Normal	64	63.4
High normal	17	16.8
Mild hypertension (Grade 1)	14	13.9
Moderate hypertension (Grade 2)	6	5.9
Diagnosis [b, d]		
Depression	62	61.4
Anxiety	6	5.9
Bipolar Affective Disorder	19	18.8
Psychosis [e]	11	11.0
Post Traumatic Stress Disorder	12	11.9
Other [f]	7	7.0

Notes

[a] Psychological distress derived from the Kessler 6

[b] Data retrieved from participant's medical records

[c] Blood pressure categories (mmHg): normal ≤129 systolic, ≤84 diastolic; high normal 130 – 139 systolic, 85 – 89 diastolic; Grade 1 hypertension (mild) 140 – 159 systolic, 90 – 99 diastolic; Grade 2 hypertension (moderate) 160 – 179 systolic, 100 – 109 diastolic; Grade 3 hypertension (severe) ≥180 systolic, ≥110 diastolic.

[d] Diagnosis: It is noted that some participants had more than one primary diagnosis.

[e] Psychosis: Schizophrenia, Schizoaffective Disorder; Psychotic Disorder
[f] Other: Obsessive Compulsive Disorder; Eating Disorder; Personality Disorder

Interest in physical activity: The mean level of interest in doing physical activity as an inpatient was 7.70 (SD 2.3), with 77% of participants expressing a high interest, 17% a moderate interest and 6% a low interest.

Reasons to do physical activity: Table 4-2 shows the proportion of participants who agreed with each of the potential reasons for doing activity. A high proportion of participants (≥ 95%) endorsed weight control, maintaining good health, managing stress, and improving emotional wellbeing. The least endorsed reason was the social aspect.

General knowledge regarding the benefits of physical activity in the management of psychological and physical conditions is summarised in Table 4-2. A high proportion of participants (≥ 90%) agreed that physical activity was beneficial for managing psychological wellbeing, heart disease, stress, diabetes and quality of life. Fewer than half the participants agreed that physical activity was beneficial for managing post-traumatic stress disorder, bipolar affective disorder, chronic fatigue and schizophrenia.

Preferences: Physical activity context preferences are summarized in Table 4-3. Two thirds of the participants preferred physical activity that can be done alone, at a fixed time, and with a set routine and format. The most commonly preferred physical activity type was walking. Approximately one quarter of participants preferred a personal trainer, physiotherapist or an exercise physiologist to recommend, design or lead physical activity programs. The least preferred sources of assistance were a general nurse or doctor.

Barriers: Lack of energy, feeling too tired and lack of motivation were the most commonly reported barriers to physical activity (Table 4-2). The ‘other’ question about additional barriers was answered by 41 (41%) participants. Five common types of additional barriers were identified: (i) physical disability (i.e. chronic pain, recovering from knee or back surgery); (ii) medication side effects (nausea, sedation, being uncoordinated and low blood pressure); (iii) health professional appointments limiting time for physical activity opportunities (iv) poor mental health and (v) limited availability of gym and group walking times and lack of gym equipment and space which were specific to this study site.

Table 4-2

Reasons for, general knowledge regarding the benefits of, and barriers to physical activity (N = 101)

	Agree n (%)	**Unsure n (%)**	**Disagree n (%)**
Reasons for doing activity			
Control my weight	99 (98.0)	0 (0)	2 (2.0)
Maintain good health	99 (98.0)	2 (2.0)	0 (0)
Help manage my stress	96 (95.0)	4 (4.0)	1 (1.0)
Help improve my emotional wellbeing	95 (94.1)	3 (3.0)	1 (1.0)
Improve my energy levels	89 (88.1)	9 (8.9)	1 (1.0)
Build up my strength	81 (80.2)	14 (13.9)	6 (5.9)
Help my flexibility	80 (79.2)	11 (10.9)	10 (9.9)
Help me sleep better	80 (79.2)	8 (7.9)	11 (10.9)
Give me space to think	74 (73.3)	10 (9.9)	16 (15.8)
To improve my appearance	65 (64.4)	19 (18.8)	17 (16.8)
Because my doctor advised me to	62 (61.4)	19 (18.8)	20 (19.8)
Because I enjoy exercising	55 (54.5)	16 (15.8)	30 (29.7)
To help manage my pain	41 (40.6)	24 (23.8)	34 (33.7)
Because I enjoy the social aspects of exercising	27 (26.7)	22 (21.8)	51 (50.5)
Physical activity is beneficial for managing			
Psychological wellbeing	96 (95.0)	3 (3.0)	2 (2.0)
Heart disease	94 (93.1)	6 (5.9)	1 (1.0)
Stress	94 (93.1)	6 (5.9)	1 (1.0)
Quality of life	94 (93.1)	6 (5.9)	1 (1.0)
Diabetes	92 (91.1)	7 (6.9)	2 (2.0)
Depression	86 (85.1)	12 (11.9)	3 (3.0)
Resilience	86 (85.1)	11 (10.9)	3 (3.0)
Coping	83 (82.2)	16 (15.8)	2 (2.0)

Anxiety	83 (82.2)	14 (13.9)	4 (4.0)
Chronic pain	62 (61.4)	31 (30.7)	8 (7.9)
Alcohol and drug disorders	49 (48.5)	46 (45.5)	6 (5.9)
Post traumatic stress disorder	45 (44.6)	52 (51.5)	4 (4.0)
Bipolar affective disorder	43 (42.6)	53 (52.5)	3 (3.0)
Chronic fatigue	40 (39.6)	57 (56.4)	4 (4.0)
Schizophrenia	23 (22.8)	71 (70.3)	5 (5.0)
Barriers			
Lack of energy	77 (76.2)	7 (6.9)	16 (15.8)
Feel too tired	75 (74.3)	7 (6.9)	18 (17.8)
Lack of motivation	74 (73.3)	9 (8.9)	17 (16.8)
Feel unwell	61 (60.4)	14 (13.9)	26 (25.7)
Physical health problems	44 (43.6)	14 (13.9)	43 (42.6)
Lack of access to facilities	41 (40.6)	13 (12.9)	45 (44.6)
Too shy or embarrassed	36 (35.6)	18 (17.8)	47 (46.5)
Not the sporty type	29 (28.7)	16 (15.8)	55 (54.5)
Do not enjoy physical activity	27 (26.7)	22 (21.8)	51 (50.5)
Do not have the right clothes	22 (21.8)	15 (14.9)	64 (63.4)
Financial cost	19 (18.8)	11 (10.9)	71 (70.3)
Bad weather: too hot/cold/raining	16 (15.8)	13 (12.9)	71 (70.3)
Feel unsafe to go outside	16 (15.8)	12 (11.9)	73 (72.3)
Do not have enough time	13 (12.9)	5 (5.0)	83 (82.2)
Worried that I might get injured	9 (8.9)	7 (6.9)	85 (84.2)
I am too old	7 (6.9)	5 (5.0)	88 (87.1)

Notes

Proportions may not add to 100% due to missing data.

Differences by psychological distress and gender: There were no significant differences by psychological distress for all items or by gender for reasons to do physical activity and barriers to physical activity. Females were more likely than males to prefer physical activity that was done with others of the same gender (X^2 = 10.5, df = 1, P = 0.001) and with others at the same level of ability (X^2 = 15.17, df = 1, P <0.001).

Table 4-3

Physical activity context preferences (N = 101)

	Male			Female			Total		
	Agree n (%)	**Unsure n (%)**	**Disagree n (%)**	**Agree n (%)**	**Unsure n (%)**	**Disagree n (%)**	**Agree n (%)**	**Unsure n (%)**	**Disagree n (%)**
I can do on my own	20 (71.4)	3 (10.7)	5 (17.9)	50 (68.5)	9 (12.3)	12 (16.4)	70 (69.3)	12 (11.9)	17 (16.8)
Are done at a fixed time	20 (71.4)	2 (7.1)	6 (21.4)	49 (67.1)	7 (9.6)	16 (21.9)	69 (68.3)	9 (8.9)	22 (21.8)
Have a set routine and format	20 (71.4)	4 (14.3)	4 (14.3)	47 (64.4)	14 (19.2)	12 (16.4)	67 (66.3)	18 (17.8)	16 (15.8)
Are done out of hospital	18 (64.3)	5 (17.9)	5 (17.9)	41 (56.2)	22 (30.1)	9 (12.3)	59 (58.4)	27 (26.7)	14 (13.9)
Are done with people at my level of ability [1]	9 (32.1)	4 (14.3)	15 (53.6)	45 (61.6)	18 (24.7)	10 (13.7)	54 (53.5)	22 (21.8)	25 (24.8)
Are done with a small group (3 -10 others)	16 (57.1)	3 (10.7)	9 (32.1)	37 (50.7)	18 (24.7)	18 (24.7)	53 (52.5)	21 (20.8)	27 (26.7)
Involve supervision (i.e. from a leader)	15 (53.6)	2 (7.1)	11 (39.3)	37 (50.7)	12 (16.4)	2 (31.5)	52 (51.5)	14 (13.9)	34 (33.7)
Are done outdoors	17 (60.7)	5 (17.9)	6 (21.4)	34 (46.6)	19 (26.0)	18 (24.7)	51 (50.5)	24 (23.8)	24 (23.8)
Are done in hospital	17 (60.7)	5 (17.9)	5 (17.9)	29 (39.7)	29 (39.7)	15 (20.5)	46 (45.5)	34 (33.7)	21 (20.8)
Are done with other people with mental illness	15 (53.6)	6 (21.4)	7 (25.0)	30 (41.1)	25 (34.2)	18 (24.7)	45 (44.6)	31 (30.7)	25 (24.8)
Are done with 1 or 2 others	7 (25.0)	9 (32.1)	12 (42.9)	32 (43.8)	25 (34.2)	15 (20.5)	39 (38.6)	34 (33.7)	27 (26.7)
Are done with people around my age	6 (21.4)	7 (25.0)	14 (50.0)	25 (34.2)	17 (23.3)	30 (41.1)	31 (30.7)	24 (23.8)	44 (43.6)

Require skill and practice	7 (25.0)	10 (35.7)	10 (35.7)	18 (24.7)	13 (17.8)	40 (54.8)	25 (24.8)	23 (22.8)	50 (49.5)
Are done with people of my own gender [2]	0 (0.0)	4 (14.3)	24 (85.7)	20 (27.4)	13 (17.8)	40 (54.8)	20 (19.8)	17 (16.8)	64 (63.4)

Notes

Proportions may not add to 100% due to missing data.

[1] Females preferred physical activity done with others at the same level of ability ($X^2 = 15.17$, df = 1, $P < 0.001$)

[2] Females preferred to do physical activity with the same gender ($X^2 = 10.5$, df = 1, $P = 0.001$)

4.5 Discussion

This study focused on inpatients to assess physical activity attitudes and preferences during the time in hospital. It extends other research on physical activity correlates of adults with mental illness by providing a more detailed assessment of preferences for physical activity context, type, and sources of assistance; reasons to do physical activity; general knowledge regarding the benefits for managing a range of physical and psychological health conditions; and barriers to physical activity during a hospital admission. This information can inform the development of physical activity programs for inpatients with mental illness.

Participants had a high level of interest in doing physical activity while in hospital. The primary reasons to do physical activity were to control weight, maintain good health, manage stress and improve emotional wellbeing. This is consistent with other research, which indicates that adults with mental illness perceive physical activity as important for improving physical and mental health [112-114]. The least endorsed reason for physical activity was the social aspect. This is in contrast with a review that indicated one of the primary benefits for adults with mental illness to participate in physical activity was an opportunity for social interaction and support [177]. This review however, was based on qualitative studies that assessed the experiences of physical activity program participants. It may be, therefore, that social benefits of physical activity can be appreciated when experienced, but are insufficient motivation to adopt activity.

Over 90% of participants agreed that physical activity has benefits for managing psychological wellbeing, chronic disease and quality of life. Again, this is consistent with other research which indicates that adults with mental illness perceive physical activity as important for improving physical and mental health [112-114]. However, more than half of all participants were unsure if physical activity had benefits for managing chronic fatigue and serious mental illnesses. These findings have important implications for psycho-education programs in hospital settings. Given participants' doubts, physical activity programs may need to indicate the benefits of physical activity for serious mental illness such as improving the positive and negative symptoms of schizophrenia [55,68].

A high proportion of participants preferred physical activities that can be done alone, at a fixed time and that have a set routine and format. Previous research has also shown that people in the general population with high levels of psychosocial distress prefer activities done at fixed times with scheduled sessions [115], and may reflect a need for structure. Findings however, are not consistent with other research with adults with mental illness which found no preference between physical activity done alone or in a group [113], and no preference for activities done with others [114]. This difference may be because these other studies included both inpatients and outpatients, while our study focused exclusively on an inpatient population. Inpatients may be reluctant to do physical activity with other patients because of social anxiety, negative body image or differing levels of fitness.

Women were significantly more likely than men to prefer activities done with others of the same gender, despite this being described as the least preferred physical activity context in this study. This contradicts previous research with psychologically distressed individuals in the general population that found no gender differences [115], and again may be attributed to our inpatient sample. Reasons for this same gender preference may be because female inpatients have a high level of self-consciousness and are more concerned with social competitiveness when doing physical activity with men. Women were also more likely than men to prefer doing physical activity with others of the same level of ability. Physical activity programs for psychiatric inpatients may therefore need to be stratified by levels of ability. Physical activity programs could also be designed to incorporate women only groups if resources allow, given that some women may prefer this option.

The most preferred physical activity type was walking, which is consistent with studies in both general [106,107] and mental health populations [113,114]. Walking is a low demand and low resource type of physical activity, and can be self paced, which may make it an attractive option, particularly for inpatients with physical co-morbidities such as chronic pain. Walking has been found in other research to be a popular and safe form of physical activity for adults with serious mental illness [69].

About one quarter to a third of participants preferred personal trainers to recommend and lead physical activity programs and exercise physiologists to design programs.

Participants' least preferred sources of assistance for physical activity were a general nurse or a doctor. This may be because participants want exercise specific specialist knowledge and instruction, and to lessen the medical focus. This contradicts previous research in both the general and mental health population which indicated a high preference for doing physical activity recommended by the doctor [107,113,114]. However, in contrast with the other studies that asked about preferred type of health professional without naming specific examples, our assessment of sources of assistance identified a range of specific and emerging allied health professionals, which may not be recognised in all countries and may not have existed at the time of previous studies.

Approximately 70% of participants identified fatigue and lack of motivation as barriers to doing physical activity while an inpatient. Physical disability, medication side effects, poor mental health and conflict with health professional appointments were also identified as further barriers to physical activity. These findings are consistent with other research with adults with mental illness [112-114] and a study of physical therapists perceptions of barriers to physical activity among persons with schizophrenia [178]. Understanding these physical activity barriers may help health professionals to develop strategies which make it easier for their patients to adopt and maintain activity while in hospital. For example, programs of short duration and low physical demand may redress barriers of fatigue and low energy. Supervision may help low motivation.

4.6 Methodological considerations

Caution should be used in generalizing the results of this study to all mental health inpatients due to sampling limitations. Our study was conducted in one private psychiatric hospital, and the majority of the participants had depression. The study sample was not random, and not all eligible patients were invited to participate and of those who did consent, not all completed the assessment. The study recruitment protocol relied on volunteers, which meant that patients who had no interest in physical activity, or those who had poor mental health, but still met the inclusion criteria, might not have participated. Also, patients who were unable to be located due to leave from the hospital at the time of recruitment were not included in the study. Results were only compared by psychological distress and gender. Future research could consider other comparisons such as by body mass index, perceived physical health or age.

4.7 Conclusions

The results of this study suggest that inpatient adults with mental illness have an interest in doing physical activity while in hospital and that weight management, maintaining good health, managing stress and improving emotional wellbeing are potential motivators. Appealing activities may include walking and physical activity sessions at a fixed time with a set routine and format. Women were more likely than men to prefer activity that can be done with others of the same gender and done with others at a similar level of ability. Preferred sources of support include an exercise physiologist, physiotherapist or a personal trainer. Barriers to physical activity centered around fatigue and lack of motivation. The information from this study has the potential to guide physical activity intervention planning and programming in hospital settings, which could contribute to decreasing the chronic disease burden, and improving psychological wellbeing in adults with mental illness.

4.8 Acknowledgments

This study was supported by Toowong Private Hospital, Brisbane, Australia, who provided gatekeeper approval to access their inpatient population. No financial support was granted for this study.

Chapter 5: Metabolic health and physical activity counselling intervention

The aim of this thesis was to understand and promote physical activity among adults with mental illness. As discussed in Chapter 1, a review of the relevant literature highlighted gaps in understanding physical activity levels, preferences and attitudes among inpatient adults with mental illness. The previous three studies in the PhD aimed to address these gaps.

In addition to understanding an inpatient population, it was identified that there is also a need to evaluate strategies to promote physical activity among adults with mental illness who reside in the community. Not all adults with mental illness get admitted to hospital, or are inpatients for an extended period of time. Interventions conducted outside of the hospital may be important to assist participants to integrate behaviour change into the everyday routine, and to access relevant community resources. It was therefore considered important that this research program include work with people not in hospital.

Research has indicated promising support for behavioural counselling to promote physical activity. These studies have primarily been conducted among adults in the general population, or people with cardiometabolic conditions. There has been little research examining the effectiveness of physical activity counselling among adults with mental illness. Although not specifically focusing on physical activity, several studies have examined the effectiveness of lifestyle counselling among adults with mental illness, with results indicating positive outcomes of improved physical activity participation, metabolic risk factors, quality of life and psychiatric symptomology. These studies suggest that it may be feasible and beneficial for adults with mental illness to engage in a face-to-face physical activity counselling intervention.

This study assessed the effectiveness of a mental health nurse led counselling intervention for adults with mental illness who reside in the community. Mental health nurses are well placed to deliver physical activity counselling as they spend a lot of time in close patient contact, both in hospital settings and in the community, and they may also experience fewer barriers to counselling than other health practitioners, e.g. less time constraints than general practitioners. The outcomes from this study can be used to inform future research, e.g. a randomised controlled trial. The study is relevant to this thesis as physical activity promotion among *all* adults with mental illness, the majority of who are not inpatients, may be key to reducing the significant gaps in life expectancy relative to the general population.

5.1 Introduction

The life expectancy of adults with mental illness is significantly less than that of the general population, which is largely due to poor physical health [13-15,179]. Physical activity is recommended for the prevention and management of many metabolic risk factors and non-communicable diseases, and is known to have benefits for improving psychological wellbeing [34,35,37,38,58,68]. Physical activity is a feasible and effective adjunctive therapy to usual care for adults across a range of mental health disorders [119], and may be a key factor in the prevention and management of the many mental and physical health problems that are prevalent in adults with mental illness [55,120].

Physical activity counselling may be an effective method for promoting physical activity among adults with mental illness. Physical activity counselling is an individualised or group based, goal orientated, discourse based approach that promotes autonomous motivation and can be delivered via different mediums (i.e. face-to-face, telephone, email). Two common frameworks for activity counselling are Motivational Interviewing [124,125] and the 5As Model [126,127]. *Motivational Interviewing* is a person-centered counselling method that works through a person's ambivalence to elicit their motivations for committing to and making a healthy behaviour change [131]. Motivational interviewing is defined by the 'spirit' which is described as being collaborative, evocative and honouring of a persons autonomy [132]. By honouring this spirit, the clinician builds a cooperative and collaborative partnership with the person; seeks to evoke the person's personal goals, values and aspirations and reasons to make healthy behaviour changes; and recognises and honours a person's individual choices [132]. The *5As Model* of behavioural counselling identifies five key components of the counselling process that need to occur to promote change: assess, advise, agree, assist and arrange [126,127,133]. Applied to promote physical activity, a clinician may: *assess* a person's knowledge and beliefs regarding physical activity, their current physical activity levels and the factors that enable and constrain activity participation; *advise* of personally relevant advantages for physical activity engagement and give the person clear and strong advice to do physical activity; *agree* (collaboratively*)* on physical activity goals; a*ssist* the person by action planning, responding to any ambivalence, identifying coping and problem solving strategies to manage barriers and competing life demands, and provide ongoing support and positive reinforcement; and finally *arrange* resources, assistance or follow-up as required [126,127,133].

Research indicates that physical activity counselling can be efficacious among the general population [124,135,136]. A Cochrane review found positive but non-significant trends in self-reported physical activity from face-to-face counselling over at least 12 months (OR: 1.52, 95% CI: 0.88 to 2.61) [134]. A meta-analysis concluded that physical activity counselling based on motivational interviewing had a significant positive impact on cholesterol (OR: 1.09, 95% CI: 1.00 to 1.19, $z = 1.92$, $p<0.05$), blood pressure (OR: 1.65, 95% CI: 1.24 to 2.19, $z = 3.45$, $p<0.001$), weight (OR: 1.17, 95% CI: 1.09 to 1.27, $z = 4.22$, $p<0.001$), quality of life (OR: 2.21, 95% CI: 1.64 to 2.96, $z = 5.28$, $p<0.001$) and intention to change in physical activity (OR: 1.97, 95% CI: 1.11 to 3.48, $z = 2.53$, $p<0.001$) [137].

Physical activity counselling is also effective in increasing physical activity and improving physical health among people with non-communicable diseases. A 12-month physical activity counselling intervention for people with type two diabetes mellitus (T2DM) increased physical activity between baseline and 6-months ($p<0.001$); and reduced HbA_{1c} by -0.26% ($p<0.05$); total cholesterol by 0.33mmol/L ($p<0.05$) and systolic blood pressure by 7.7mmHg ($p<0.05$) [141]. Increases in physical activity were maintained at 12-months ($p<0.05$) [141]. A meta-analysis concluded that motivational interviewing significantly increased physical activity levels among people with chronic conditions such as obesity, cardiovascular disease (CVD) and multiple sclerosis (SMD: 019, 95% CI 0.06 to 0.32, $p = 0.004$) [125].

Little research however, has examined the effectiveness of physical activity counselling among adults with mental illness. A study of four obese adults with schizophrenia suggested that physical activity counselling is feasible among this population, and although participants' physical activity levels did not significantly increase over the two month study period, increases were seen in important determinants of physical activity, i.e. perceived benefits of physical activity and self efficacy [142]. A study of 34 adults with binge eating disorder indicated that when used in conjunction with a cognitive behavioural program, activity counselling improved participation in leisure time physical activity and significantly improved self-perceptions [143]. Although not specifically focused on physical activity counselling, some studies have examined lifestyle counselling interventions (focusing on e.g. a combination of physical activity and diet) among adults with mental illness. Results from these studies indicate that lifestyle counselling interventions are effective for reducing weight [144-150], increasing physical activity participation [145], and for improving metabolic risk factors [68,147,148], quality of life [150] and psychiatric symptomology [68,149] among adults with mental illness. Few of these studies have also examined the impact on psychosocial wellbeing.

The aim of this study was to evaluate the effects of a metabolic health and physical activity counselling program on improving the metabolic health indicators, physical activity levels and psychosocial wellbeing of outpatient adults with mental illness.

5.2 Methods

This was a repeated measures, single group, two stage intervention trial. Ethical clearance was received from The University of Queensland Human Research Ethics Committee (2014000483). Recruitment was over a seven month period in 2014. Study participants were adults with mental illness (18-75 years) who attended an outpatient clinic at a private psychiatric hospital in Brisbane, Australia. Individuals were referred in writing to the clinic by their treating psychiatrist or general practitioner. Once a referral was received, the nurse researcher contacted the individual by phone and invited them to attend the clinic. If they agreed to attend, a letter was sent indicating the date and time of their first appointment.

Individuals were assessed by the researcher for study eligibility at their first clinic appointment and were invited to participate in the research study if they met the following inclusion criteria: (i) had a psychiatric diagnosis as defined by the Diagnostic and Statistical Manual of Mental Disorders, 5th Edition; (ii) were prescribed psychotropic medication; (iii) had the capacity to be ambulatory and (iv) resided within the Brisbane region. Individuals were not eligible if they (i) were an inpatient at the time of the baseline assessment or (ii) had a diagnosis of a feeding or eating disorder. Individuals were given an information sheet outlining stage one (19 weeks) of the study and written informed consent was obtained prior to commencement of baseline assessment. Individuals who did not meet the study eligibility criteria or declined to participate in the study, were still eligible to attend the clinic and receive treatment, however their information was not included in the analyses.

Participants were verbally invited by the researcher to attend stage two (an additional 12 weeks) of the study during the final week of stage one (week 19). Participants were given a written information sheet outlining the additional requirements and written informed consent was obtained prior to the start of stage two of the intervention.

5.2.1 Procedure

A summary of the timing of the intervention and assessment components is outlined in Table 5-1 and an overview of the study procedure is outlined in Table 5-2. The intervention was divided into two stages: stage one was conducted over 19 weeks and stage two, which followed immediately on from stage one, was conducted over 12 weeks. Both stages involved individual face-to-face counselling with the nurse researcher and progress reviews with a medical practitioner, with a 50% reduction in counselling sessions in stage two. Counselling sessions were conducted every three weeks during stage one (weeks 1, 4, 7, 10, 13, 16 and 19) and every six weeks during stage two (weeks 25 and 31). Progress reviews were conducted every six weeks during both stage one and two (weeks 1, 7, 13,19, 25 and 31).

Assessment included self-administered questionnaires, measures of blood pressure and anthropometry by the nurse researcher, and objective measurement of physical activity and sedentary behaviour. Questionnaires were administered at baseline, post stage one (after the counselling session in week 19) and post stage two (after the counselling session in week 31) of the intervention to assess (i) self-reported physical activity and sedentary behaviour, (ii) depression, anxiety and stress, (iii) quality of life, (iv) perceived reasons to do physical activity, (v) general knowledge about the benefits of physical activity, and (vi) barriers to physical activity. Questionnaires to assess depression, anxiety and stress were also administered with the medical review at weeks 7 and 13. Sociodemographic and health questions were included in the baseline survey and participant feedback questions were included in the post stage one and post stage two surveys.

Height was assessed at baseline only. Blood pressure and waist circumference were measured every six weeks throughout the study as part of the medical reviews (baseline and weeks 7, 13, 19, 25 and 31). Weight was measured at each of the counselling sessions (weeks 1, 4, 7, 10, 13, 16, 19, 25 and 31). Accelerometers were given to participants to objectively assess physical activity and sedentary behaviour at baseline, and during the week before mid stage one (week 10) and post stage one (week 19). Monitors were returned in person or by mail.

Table 5-1
Timing of study intervention and assessment components

	Baseline	Week 1	Week 4	Week 7	Week 10	Week 13	Week 16	Week 19	Week 25	Week 31
Intervention	**Stage One**								**Stage Two**	
Medical review		X		X		X		X	X	X
Physical activity counselling		X	X	X	X	X	X	X	X	X
Assessment										
Height	X									
Weight	X	X	X	X	X	X	X	X	X	X
Waist circumference	X			X		X		X	X	X
Blood pressure	X			X		X		X	X	X
Self-report physical activity and sedentary behaviour	X							X		X
Objective measurement of physical activity and sedentary behaviour	X				X			X		
DASS 21[1]	X			X		X		X		X
WHOQOL-BREF[2]	X							X		X

[1] DASS 21: Depression, Anxiety and Stress Scale
[2] WHOQOL-Bref: World Health Organisation Quality of Life – Bref

Table 5-2

Metabolic health and physical activity counselling study procedure

Week	Practitioner	Intervention	Assessment	Other
-1 Baseline	Medical Practitioner	No intervention	Physical health history	Given form to get fasting bloods done at an external pathology clinic
	Nurse Researcher	No intervention	Blood pressure Anthropometric measurements Baseline survey	Follow-up appointment booked and reminder appointment letter sent Given accelerometer, activity diary, pedometer, step log and food diary
1	Medical Practitioner	Participant feedback regarding baseline assessment	No assessment	Written assessment summary forwarded to psychiatrist and general practitioner
	Nurse Researcher	Physical activity counselling and lifestyle advice	Weight Objective physical activity and sedentary behaviour completed	Written lifestyle information given
4	Nurse Researcher	Physical activity counselling framework	Weight	
7	Medical Practitioner	Review of progress Lifestyle advice	No assessment	
	Nurse Researcher	Physical activity counselling and lifestyle advice	Blood pressure Anthropometric measurements DASS 21[1]	Accelerometer and activity diary given
10	Nurse Researcher	Physical activity counselling and lifestyle advice	Weight Objective physical activity and sedentary behaviour completed	

Week	Practitioner	Intervention	Assessment	Other
13	Medical Practitioner	Review of progress Lifestyle advice	No assessment	
	Nurse Researcher	Physical activity counselling and lifestyle advice	Blood pressure Anthropometric measurements DASS 21 [1]	
16	Nurse Researcher	Physical activity counselling and lifestyle advice	Weight	Accelerometer and activity diary given
Week 19 Post-stage one intervention	Medical Practitioner	Review of progress Lifestyle advice	No assessment	
	Nurse Researcher	Physical activity counselling and lifestyle advice	Blood pressure Anthropometric measurements Post-stage one survey Objective physical activity and sedentary behaviour completed	Invitation given to stage two of the intervention
25	Medical Practitioner	Review of progress Lifestyle advice	No assessment	
	Nurse Researcher	Physical activity counselling and lifestyle advice	Blood pressure Anthropometric measurements	
31 Post-stage two intervention	Medical Practitioner	Review of progress Lifestyle advice	No assessment	
	Nurse Researcher	Physical activity counselling and lifestyle advice	Blood pressure Anthropometric measurements Post-stage two survey	

[1] DASS 21: Depression, Anxiety and Stress Scale

5.2.2 Baseline assessment

A medical practitioner documented a detailed physical health history noting psychiatric diagnosis and current prescribed medications. The medical practitioner gave the participant a pathology request form for fasting blood glucose, fasting total cholesterol (TC), high-density lipoprotein (HDL) cholesterol, low-density lipoprotein (LDL) cholesterol, triglycerides and HDL/cholesterol ratio. The results were used as part of the assessment of risk for Metabolic Syndrome, which was used to describe participants' health characteristics.

Participants' blood pressure and anthropometric measures were taken by the nurse researcher. The baseline survey was administered and participants were given an accelerometer and activity diary and instructed to complete assessment before the next appointment (week 1). Participants were given a Yamax Digi-walker 200 pedometer and instructed to wear this daily and complete a step log (Appendix E.11), and a food diary and instructed to complete this for two weeks (Appendix E.12). The pedometer and food diary were used as additional motivation/monitoring tools and were not included in the assessment. A two week follow-up appointment was booked for the participant and a reminder appointment letter was sent.

5.2.3 Intervention

5.2.3.1 Metabolic health and physical activity counselling sessions

The metabolic health and physical activity counselling sessions were conducted by the nurse researcher every three weeks during stage one of the intervention, and every six weeks during stage two. On concurrent weeks, the counselling sessions occurred after medical review. The major component (85%) of each session was individually tailored physical activity counselling based on the 5A's Model. The 5As Model of behavioural counselling identifies five key components of the counselling process that need to occur to promote change: assess, advise, agree, assist and arrange [126,127,133]. An overview of how this model was applied in this study is described in Table 5-3. A motivational interviewing approach was taken to elicit participant's personal thoughts and experiences of activity, and to respond to any ambivalence. The remaining 15% of each counselling session involved the nurse researcher providing generic lifestyle advice regarding diet; smoking cessation and sleep hygiene; and reinforcing the lifestyle advice given by the medical practitioner during medical review.

The framework for the initial physical activity counselling session is provided in Appendix E.13. The session focused on understanding the participants' knowledge and beliefs about physical activity and mental health, attitudes towards improving physical activity, clear and strong advice to be physically active, and preliminary goal setting for change. Participants were provided with written resources describing physical activity recommendations, the benefits of physical activity for mental health, tips on how to increase daily step counts and generic healthy lifestyle advice.

During subsequent counselling sessions, the follow-up physical activity counselling framework (Appendix E.14) was administered. These sessions focused on assessing participants' physical activity and change experiences, reviewing and resetting goals, problem solving barriers, and supporting change.

Table 5-3

The 5As Model for behavioural counselling as applied to promote physical activity in this study

Stage	Intervention Activities
Assess	• Knowledge and beliefs regarding physical activity and mental health. • Current physical activity levels based on the FITT (frequency, intensity, type and time) principles. • Psychosocial factors related to activity. For example: readiness to change, reasons to change, barriers and enablers to change, past change experiences, social support and self-efficacy.
Advise	• Reflect personalised advantages and challenges for engaging in physical activity. • Confirm the individual's understanding of physical activity and correct any misconceptions they may have. • Clear and strong advice to do physical activity.
Agree	• Establish a contract with the individual to engage in physical activity change and agree on goals that are specific, measureable and attainable within an established timeframe. • Respond to any ambivalence the individual may have towards physical activity engagement.
Assist	• Collaborate to make an action plan for engaging in physical activity. This should consist of activities that are safe, enjoyable and are likely to be accomplished. The action plan should include the frequency, duration and location of physical activity and supports required to engage in the activity. • Provide the individual with a written copy of the agreed action plan, relevant printed support materials (i.e. community resources, local walking tracks) and self-monitoring tools (i.e. pedometer). • Explore approaches used to change activity in the past (differentiating between successful and unsuccessful). • Identify coping strategies that the individual can utilize to manage competing life demands and barriers to physical activity. • Provide support and positive reinforcement. • Provide written resources, e.g. national physical activity recommendations, fact sheet on how to increase steps.
Arrange	• Arrange a follow-up counselling session (i.e. face-to-face)

5.2.3.2 Medical review

The medical review sessions were conducted by a medical practitioner every six weeks during stage one and two of the intervention. In the first session, the medical practitioner reviewed the participant's results from the baseline assessment (blood pressure, anthropometric measures, fasting bloods, pedometer steps and food diary) and provided feedback and recommendations for change.

In the subsequent sessions (weeks 7, 13, 19, 25 and 31), the medical practitioner reviewed the participant's progress in relation to their anthropometric measurements and goals identified in the counselling sessions. During each review, the participant was provided with individual tailored lifestyle advice regarding physical activity, diet and metabolic health.

5.2.4 Measures

The primary outcome measures for this study were waist circumference (WC) and waist-to-height ratio (WHtR). Studies indicate that these measures are key predictors of adverse metabolic health outcomes (i.e. CVD and diabetes) and better than body mass index (BMI) as a predictor [180,181]. Secondary outcome measures included: weight; BMI; blood pressure (BP); physical activity and sedentary behaviour; psychosocial wellbeing; and quality of life. Other measures included: participant engagement, sociodemographic and health characteristics and participant satisfaction. Data on participant physical activity attitudes and barriers were used to inform the counselling sessions.

5.2.4.1 Anthropometric measurement and blood pressure

All measures were conducted by the nurse researcher. Waist circumference was measured in centimeters (cm) and was taken in the horizontal plane, midway between the inferior margin of the participants' ribs and the superior border of their iliac crest [182]. Height was measured using a wall mounted stadiometer. Weight was measured using an electronic scale, calibrated annually to the nearest 0.1kg (Tanita model, BWB-800, Wedderburn Scales). Body mass index (BMI) was calculated using the formula: weight (kg) / height (m)^2. Waist to Height Ratio (WHtR) was calculated using the formula: waist circumference (cm) / height (cm). Resting blood pressure was measured using a Welch Allyn Spot Vital Signs 42NOB machine, which was calibrated annually.

5.2.4.2 Physical activity and sedentary behaviour

Self-reported physical activity was assessed using a modified version of the Active Australia survey [154]. Items assessed the frequency of and total time spent walking for transport, walking for recreation and leisure, and in moderate- and vigorous-intensity activity during the previous week. The Active Australia survey has been used in national and state surveys [154,155] and has acceptable psychometric data with reliability coefficients ranging from 0.56-0.64 for each category of activity [170].

Self-reported sedentary behaviour was assessed using a questionnaire which asks about time spent sitting on each of a usual weekday and weekend day in (i) travelling to and from places, (ii) at work, (iii) watching television, (iv) using a computer and (v) leisure time [156]. The questionnaire has high reliability for weekday sitting at work, watching television and using a computer (r = 0.84-0.78), but lower reliability for weekend days across all domains (r = 0.23-0.74) [156].

Objective physical activity and sedentary behaviour were assessed using Actigraph GT3x+ accelerometers. Participants wore the accelerometer positioned on the right hip on a belt around the waist during waking hours for seven consecutive days, and recorded in an activity diary the times (i) they got out of bed in the morning and went to bed at night and (ii) anytime they took off the accelerometer and the time they put it back on.

5.2.4.3 Psychological wellbeing

Depression, anxiety and stress were assessed using the Depression, Anxiety and Stress Scale-21 (DASS 21). The DASS 21 consists of 21 items and has been shown to have good reliability and validity in clinical adult populations [183-186]. Items assess a range of experiences such as “I found it hard to wind down”, “I felt like I was using a lot of nervous energy”, and “I felt down-hearted and blue”. Participants indicated the extent to which each statement applied to them over past week using a four point (0 – 3) Likert scale (did not apply, sometimes, a good part of the time, most of the time).

Quality of life was assessed using the abbreviated version of the World Health Organisation Quality of Life scale (WHOQOL-BREF). The WHOQOL-Bref consists of 26 items and is comprised of four sub scales (physical health, psychological health, environment and social relationships). Items assess experiences such as “to what extent do you feel your life to be meaningful?”, “how healthy is your physical environment?”, “are you able to accept your bodily appearance?” and “how satisfied are you with the support you get from your friends?”. It has been shown to have good to excellent reliability and performs well in tests of validity in adult populations [187,188]. Participants indicated their response using five point Likert scales.

5.2.4.4 Participant engagement

Participant engagement included counts of the number of people who were referred to the program and were eligible, invited, consented and provided data. Session attendance rates were calculated. Reasons for session non-attendance and study non-completion that were verbally volunteered from the participants were noted.

5.2.4.5 Sociodemographic and health characteristics

Sociodemographic variables were assessed at baseline using standard questionnaire items. Variables included gender, age, household composition, employment status and education. Data on diagnosis and medications were obtained verbally from the participant during the baseline assessment. As participants could be assigned multiple diagnoses, each diagnosis was recorded. Metabolic Syndrome risk was determined using the International Diabetes Federation (IDF) definition [25] (Table 5-4). For this study, participants were categorised as being at risk of developing Metabolic Syndrome if they had central obesity plus one other risk factor.

Table 5-4

International Diabetes Federation definition of metabolic syndrome

For a person to be defined as having Metabolic Syndrome, they must have: **Central obesity** (defined as waist circumference (cm) with ethnicity specific values) Plus **two** of the following four factors	
Raised triglycerides	≥ 1.7 mmol/L or specific treatment for this lipid abnormality
Reduced HDL cholesterol	< 1.03 mmol/L in males < 1.29 mmol/L in females or treatment for this lipid abnormality
Raised blood pressure	Systolic BP ≥ 130 or diastolic BP ≥ 85 mm Hg or treatment of previously diagnosed hypertension
Raised fasting plasma glucose	≥ 5.6 mmol/L or previously diagnosed type 2 diabetes

5.2.4.6 Participant satisfaction

At post stage one, participants were asked to indicate on a ten point Likert scale how satisfied they were with (i) the metabolic health counselling program, (ii) the sessions with the nurse, (iii) the sessions with the medical practitioner, (iv) the pedometer and (v) the written materials provided. A score of 1 – 3 indicated low satisfaction, 4 – 6 moderate satisfaction and 7 – 10 high satisfaction. Participants were also asked the following open ended questions in the questionnaire (i) was there anything that made it difficult for you to attend the program, (ii) what were the positive aspects of the program, (iii) what were the negative aspects of the program and (iv) what changes could be made to improve the program. Participants were also provided with space to provide any further written comments regarding the program.

At post-stage two of the intervention, participants were asked to indicate (i) preferred frequency of seeing the nurse for counselling during the first two months, between months three and five and between months six and eight of the intervention; and (ii) preferences for the intervention duration. Participants were again provided with space to provide any further written comments regarding the program.

5.2.4.7 Physical activity attitudes and barriers

Perceived reasons for doing physical activity were assessed using an 18-item questionnaire that assessed reasons such as "to improve my appearance" and "to improve my emotional wellbeing". G*eneral knowledge regarding the benefits of physical activity* for "managing" a range of physical and psychological health conditions were assessed using an 18-item questionnaire that assessed a range of both physical and mental health benefits, i.e. heart disease, diabetes, resilience, stress, depression and schizophrenia. *Barriers to physical activity* were assessed using a 24-item questionnaire that assessed issues such as poor physical health, lack of skill, weight and lack of motivation. All three questionnaires have previously been used in research with adults with mental illness [189]. Participants indicated the extent to which they disagreed or agreed with each questionnaire item using a five point Likert scale (strongly disagree, disagree, unsure, agree and strongly agree).

5.2.5 Data management

5.2.5.1 Physical activity and sedentary behaviour

Self-reported physical activity data were included in the analyses if duration was available for at least one questionnaire item. Missing data were imputed with a zero. To avoid potential over-reporting, reported times greater than 840 minutes (14hrs/week) for a single activity type were truncated at 840 minutes [154]. Total self-reported moderate- to vigorous-intensity physical activity (MVPA) was calculated in weighted minutes/week by adding time in walking for transport, walking for recreation and exercise, and moderate- and vigorous- intensity activity, with vigorous activity weighted by two to allow for its greater intensity. To further avoid potential over-reporting, total MVPA times were truncated at 1680 minutes (28 hours/week) [154].

Self-reported sedentary behaviour data were included in the analyses if reported duration was available for at least one questionnaire item. Total daily weekday and weekend day sedentary behaviour times were derived by summing times across the five domains. To avoid potential over-reporting, total daily self-reported sedentary behaviour were truncated at 1080 minutes (18 hours/day).

Objective physical activity and sedentary behaviour: Actigraph software was used to analyse the data retrieved from the GT3x+ accelerometers. Participants' day hours were defined by self-reported time out of bed in the morning and time to bed at night (data from the activity diary). Data for this study were considered valid if the monitor was worn for at least eight hours/day on three days of the week. Accelerometer non-wear time was identified from participants' activity diaries and from consecutive zero counts for 60 minutes or longer. The cut-point criteria used were 0–99 counts per minute for sedentary activity, 100–2019 for light activity, 2020–5998 for moderate activity and 5999 or greater for vigorous activity [161]. Durations of moderate and vigorous intensity activity were combined and time spent in sedentary, light and MVPA were calculated as average minutes/day.

5.2.5.2 Psychological wellbeing

DASS 21 data were scored for each domain and multiplied by two to account for using the short form version of the DASS 42[190]. For the depression subscale, a score of 0 – 13 indicated normal to mild depression, a score of 14 – 20 indicated moderate depression and a score of ≥ 21 indicated severe to extremely severe depression. For the anxiety subscale, a score of 0 – 9 indicated normal to mild anxiety, a score of 10 – 14 indicated moderate anxiety and a score of ≥ 15 indicated severe to extremely severe anxiety. For the stress subscale, a score of 0 – 18 indicated normal to mild stress, a score of 19 – 25 indicated moderate stress and a score of ≥ 26 indicated severe to extremely severe stress.

WHOQOL-BREF data were scored for the four different domains (physical health, psychological, social relationships and environment). If greater than 20% of items were missing from the assessment, the data were case wise deleted [191]. If ≤ 2 items were missing for the physical health, psychological and environment domains and ≤ 1 item for the social relationships domain, the mean of the remaining domain items were calculated and substituted for the missing item; otherwise the domain score was not calculated [191]. Higher domain scores reflected a higher quality of life.

5.2.5.3 Physical activity attitudes and barriers

Due to the small sample sizes for some responses were collapsed into categories of disagree, unsure and agree.

5.2.6 Data analyses

Analyses were conducted using SPSS version 23. Data for self-report and objective physical activity and sedentary behaviour, and WHOQOL-BREF, were included in the analysis if both baseline and post-intervention/extension data were available. If data for any of these outcome measures were missing, that participant was case-wise deleted and not included in the analysis for the measure. For repeated measures data, (weight, waist circumference, blood pressure and DASS 21), participants were case-wise deleted and not included in the analysis if data were not available for more than two assessment points (i.e. >6 weeks). For missing data that were <6 weeks apart, the last observation was carried forward.

Descriptive statistics were used to summarise quantitative data. Participant change scores were calculated for each measure. Data normality testing was conducted using the Shaprio-Wilk Test of Normality (used for samples <50). For each measure, paired t-tests were used to assess pre-post differences among normally distributed data and Wilcoxin sign rank tests were used to assess pre-post differences among non-normal distributed data. Separate pre-post analyses were conducted for baseline and post stage one intervention data (week 19), and baseline and post stage two data (week 31) were used for the analysis. As this was an exploratory study, an alpha of $p = <0.05$ was kept to test for statistical significance, despite the number of comparisons.

5.3 Results

5.3.1 Participant engagement

Participant engagement is presented in Figure 5-1. During the recruitment period, 27 people were referred to the clinic; 100% met the study eligibility criteria and were invited to participate. Of these, 23 (85%) consented, and 21 (91%) attended baseline assessment. Of those who attended baseline assessment, 18 (86%) commenced stage one of the behavioural counselling intervention, of which 16 (89%) attended the final counselling session at week 19. Ten (56%) participants adopted stage two and all of these (100%) attended the final counselling session at week 31.

Reasons for declining the study invite (n = 4) included living too far away (>100 km) (n = 2) and lack of interest (n = 2). Two participants did not attend the baseline assessment and were unable to be contacted. Three participants did not start the intervention after completing the baseline assessment. Reasons included a deterioration in mental wellbeing (n = 1) and a discontinued interest (n = 2). Two participants did not complete the stage one intervention to week 19. One dropped out after week four as they were satisfied with their progress and felt they no longer needed assistance, and the other dropped out after week 13 citing an increase in external stressors.

Of the 16 participants who completed the stage one of the intervention (19 weeks), all attended at least six of the eight physical activity counselling sessions. Nine participants (56%) attended all eight sessions; four (25%) attended seven sessions; and three (19%) attended six sessions. Reasons for session non-attendance (n = 10) included poor physical health (n = 3); attendance at another specialist appointment (n = 2); overseas holiday (n = 2); hospital admission (n = 2) and unable to access transport to the session (n = 1). Six participants declined to participate in stage two of the intervention. Reasons given included: deterioration in mental health requiring hospitalisation (n = 2), upcoming weight-loss surgery (n = 2), full-time work commitments (n = 1), and dissatisfaction with the counselling program (n = 1). Of the ten participants who completed stage two of the intervention, nine participants (90%) attended the first session and all ten participants (100%) attended the second (and final) session. The reason for session non-attendance (n = 1) was overseas holiday.

5.3.2 Participant characteristics

Demographic and health characteristics of the participants who completed the two post assessments are summarized in Table 5-5. At baseline, the mean age was 38.8 years (SD 10.7) and 81% were female. The majority (69%) of participants had a depressive disorder and ten (63%) participants were prescribed at least one atypical antipsychotic with the most common being Quetiapine (n = 7). All participants were categorised as obese, of which 31% were classified as morbidly obese. Twelve participants (75%) were categorised as having Metabolic Syndrome at baseline.

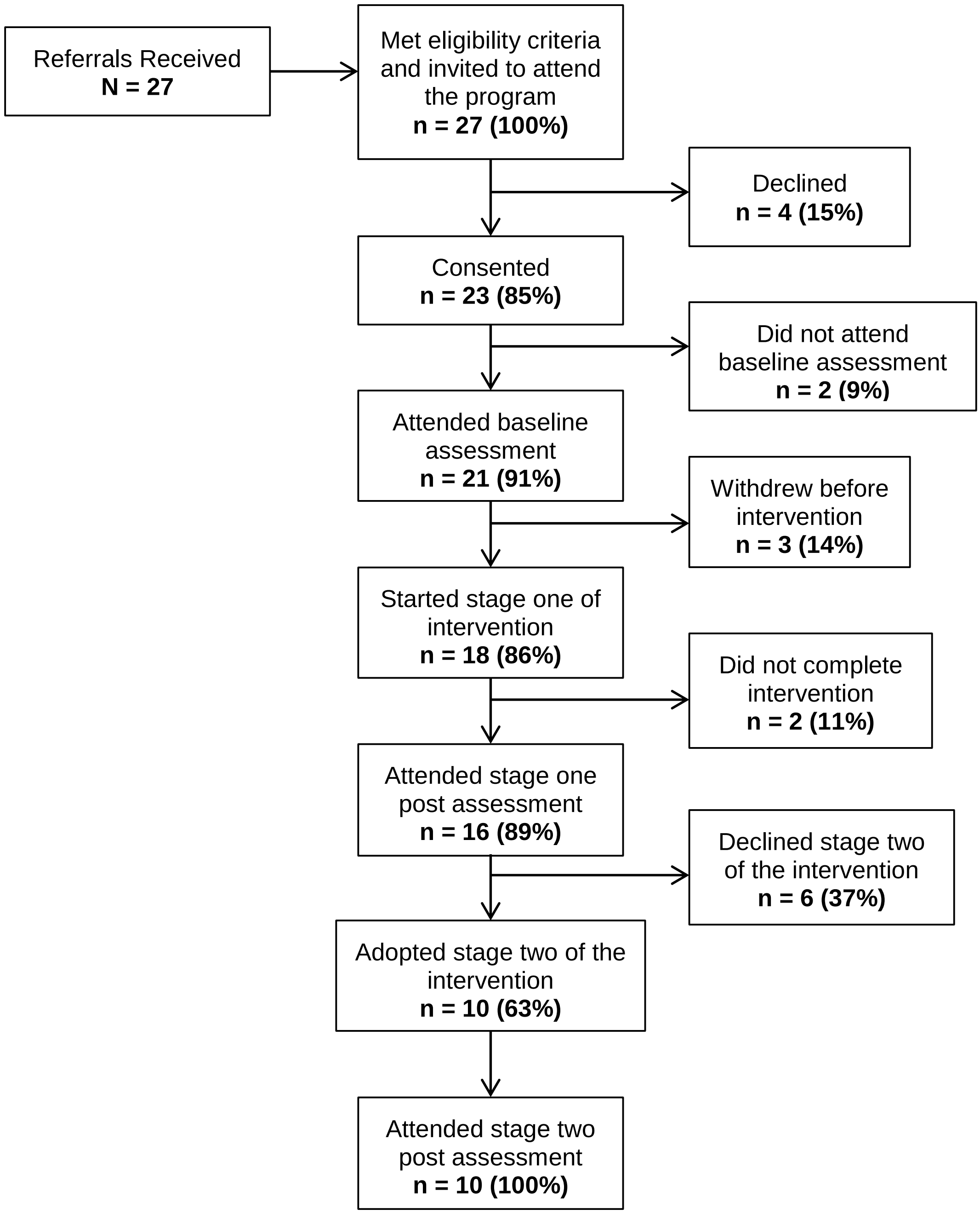


Figure 5-1: Participant flow chart

Table 5-5

Sociodemographic and health characteristics of participants

	Stage One (19 weeks) N = 16		Stage Two (31 weeks) N = 10	
Mean (SD) Age (years)	38.8 (10.7)		34.6 (7.7)	
	n	(%)	n	(%)
Gender				
Male	3	18.8	3	30.0
Female	13	81.3	7	70.0
Country of birth				
Australia	15	93.7	9	90.0
Other	1	6.3	1	10.0
Household composition				
Single living alone	2	12.5	2	20.0
Single living with others	4	25.0	2	30.0
Single living with children	1	6.3	0	0.0
Couple without children	4	25.0	3	30.0
Couple with children	5	31.3	3	30.0
Employment situation				
Not working [a]	4	6.3	3	30.0
Pensioner on benefits (not old age)	7	43.8	6	60.0
Paid part time / casual work	1	6.3	0	0.0
Full time paid employment	4	25.0	1	10.0
Income Management				
Difficult all the time	7	43.8	4	40.0
Difficult some of the time	4	25.0	3	30.0
Not too bad	5	31.3	3	30.0
Education				
School only	5	31.3	4	40.0
Trade certificate / apprenticeship / diploma	4	25.0	3	30.0
Bachelor / post-graduate degree	7	43.8	3	30.0

	Stage One (19 weeks) N = 16		Stage Two (31 weeks) N = 10	
BMI (kg/m^2)				
Overweight: 25 – 29.9	0	0	0	0.0
Obese: 30 – 39.9	11	68.8	8	80.0
Morbidly obese: > 40	5	31.3	2	20.0
Diagnosis [b, c]				
Depression	11	68.8	5	50.0
Anxiety	3	18.8	2	20.0
Bipolar Affective Disorder	1	6.3	1	10.0
Psychosis	3	18.8	3	30.0
Post Traumatic Stress Disorder	2	12.5	2	30.0
Personality Disorder	1	6.3	0	0.0
Psychotropic Medication [d]				
Atypical Antipsychotic	10	62.5	7	70.0
Mood Stabiliser	7	43.8	5	50.0
Antidepressant	14	87.5	8	80.0
Cigarette Smoking Status				
Yes	3	18.8	2	20.0
Metabolic Syndrome Profile [e]				
Diagnosis of Metabolic Syndrome	12	75.0	7	70.0
At risk of Metabolic Syndrome [f]	2	12.5	1	10.0
Missing data	2	12.5	2	20.0

Notes

[a] Not working: Looking for employment, full time house keeping, retired, studying, volunteering

[b] Diagnosis: Some participants had more than one primary diagnosis.

[c] Psychosis: Schizophrenia, Schizoaffective Disorder; Psychotic Disorder

[d] A list of participants' prescribed psychotropic medication is summarised in Appendix E.15

[e] A list of participants' metabolic risk factors is summarised in Appendix E.16

[f] At risk of Metabolic Syndrome: central obesity plus one other metabolic risk factor

5.3.3 Stage one results

Sixteen participants completed stage one of this study (19 weeks). The primary outcomes for this study were waist circumference and waist-to-height ratio. With a sample size of 16 and $p < 0.05$, this study had a power of 72% to detect a change of 2cm in waist circumference.

5.3.3.1 Metabolic health indicators

A summary of the metabolic health indicators at baseline and stage one post assessment are presented in Table 5-6.

Table 5-6

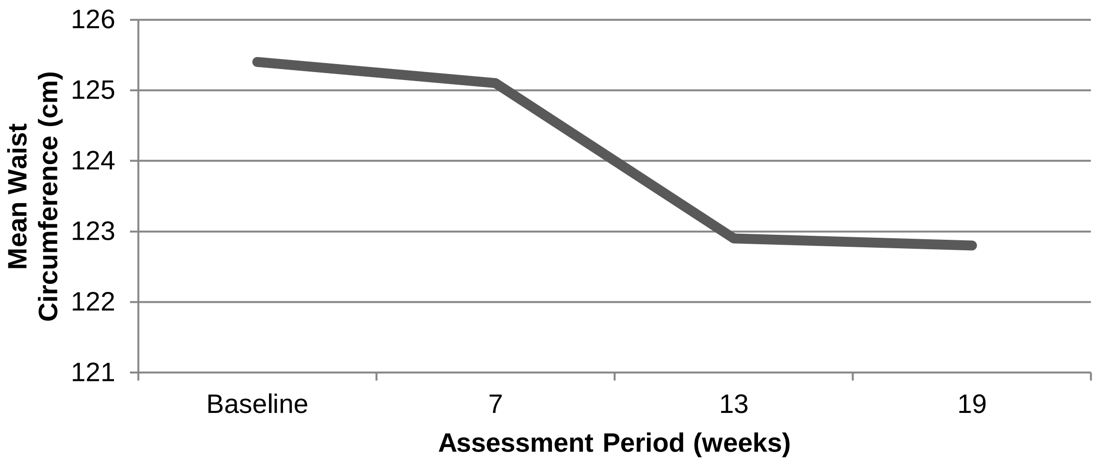
Change in metabolic health indicators after 19 weeks counselling

Outcome measure	Baseline	Post stage one study		Statistics	
	Mean (SD)	Mean (SD)	Mean change (95% CI)		p value
Waist circumference (cm)	125.44 (8.77)	122.75 (11.71)	-2.69 (-5.15, -0.22)	t(15) = 2.322	0.035
Waist to height ratio	0.75 (0.049)	0.73 (0.065)	-0.016 (-0.031, -0.001)	t(15) = 2.294	0.037
Weight (kg)	107 (16.46)	105.2 (18.84)	-1.8 (-4.16, 0.62)	t(15) = 1.577	0.136
BMI (kg/m^2)	38.2 (5.04)	37.5 (6.02)	-0.65 (-1.55, 0.25)	t(15) = 1.533	0.146
Systolic blood pressure (mmHg)	125.9 (11.51)	122.4 (13.67)	-3.56 (-9.61, 2.49,)	t(15) = 1.256	0.228
Diastolic blood pressure (mmHg)	80.4 (5.72)	80.69 (S7.75)	0.25 (-4.84, 5.34)	t(15) = -0.105	0.918

Primary Outcomes: Waist Circumference and Waist to Height Ratio

Mean waist circumference and waist to height ratio over time are presented in Figure 5-2 and individual change scores are presented in Figure 5-3. There was a statistically significant mean decrease in waist circumference of 2.7cm and waist to height ratio of 0.02 points. Eight participants (50%) had a decrease in waist circumference of at least 2.5cm, with the greatest changes being -12.5cm and -11cm. Eight participants (50%) had a decrease in their waist to height ratio with the greatest changes being –0.08 and -0.07 points.

a) Waist circumference



b) Waist to height ratio

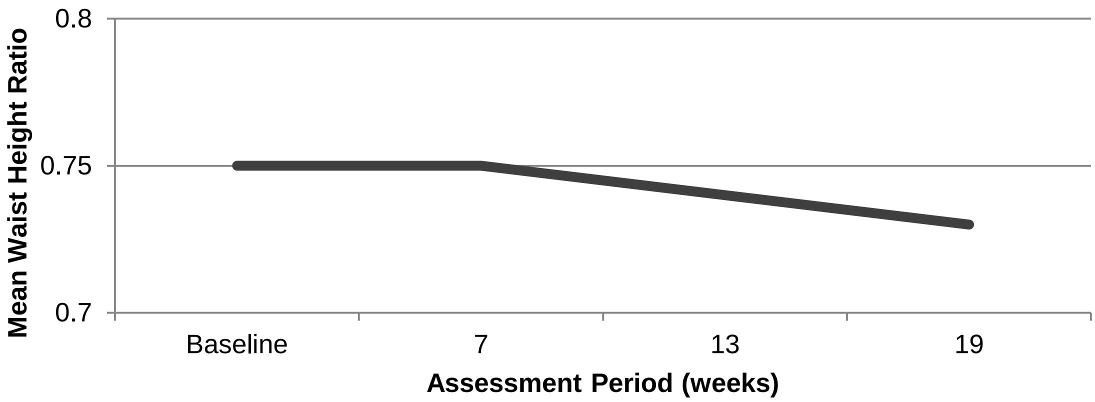
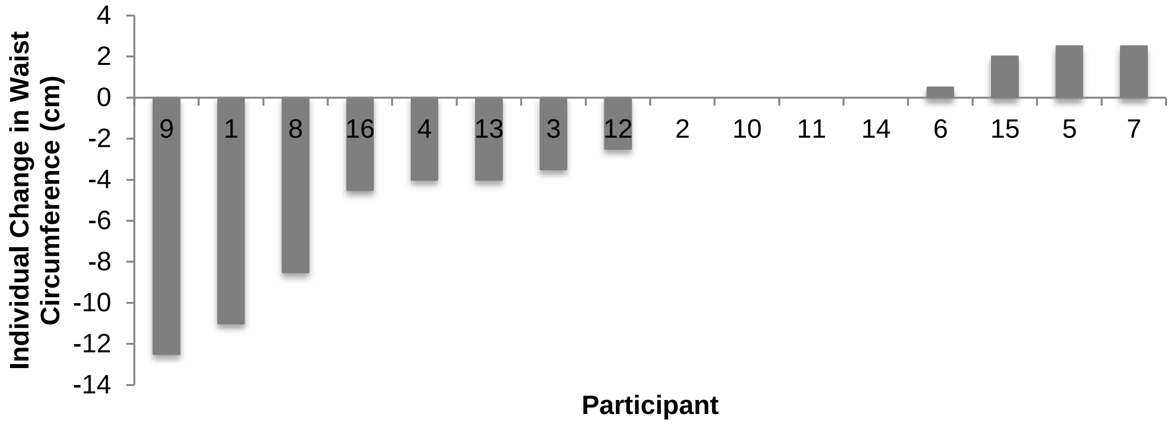


Figure 5-2: Mean waist circumference (cm) and waist to height ratio between baseline and week 19 (N = 16)

a) Waist circumference



b) Waist to height ratio

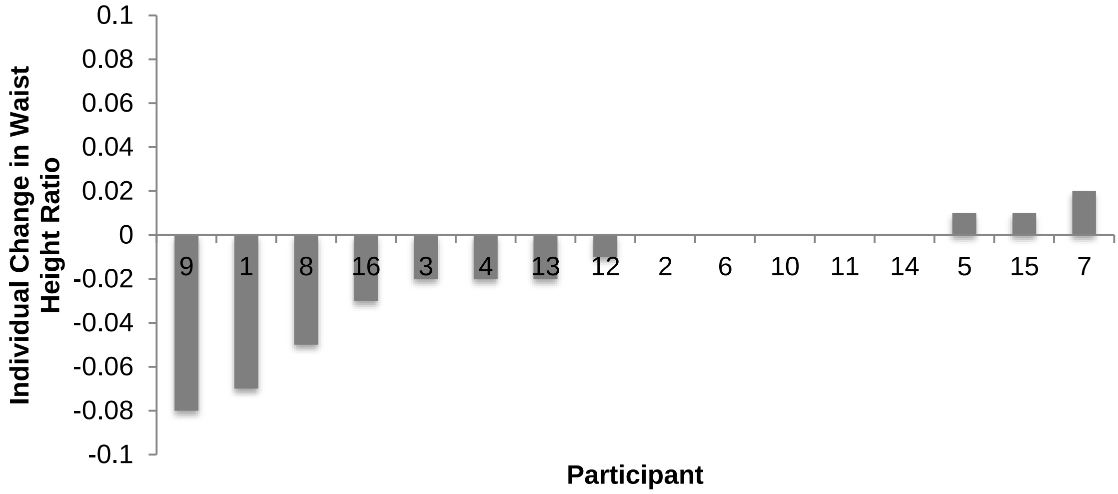
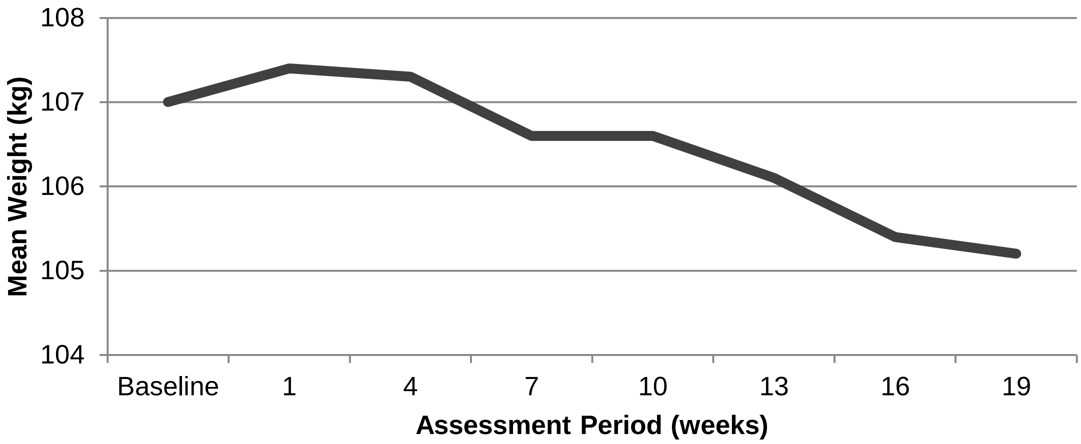


Figure 5-3: Individual change in waist circumference and waist to height ratio between baseline and week 19 (N = 16)

Weight and Body Mass Index

Mean weight and body mass index (BMI) over time are presented in Figure 5-4 and individual change scores are presented in Figure 5-5. There were non-significant mean decreases in weight and BMI of 1.8kg and 0.7 kg/m^2 respectively. Six (38%) participants had a weight change of more than -4.5kg, and the greatest change in a participant's weight was -11.6kg. Six (38%) participants had a change in BMI of more than -1.5 kg/m^2 with the greatest changes being -3.1 and -4.3 kg/m^2.

a) Weight



b) Body mass index

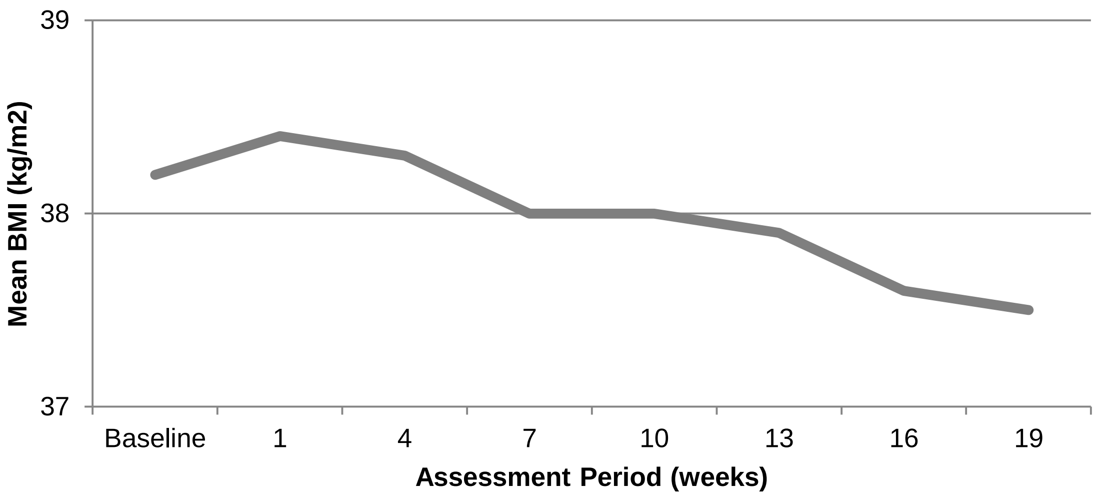
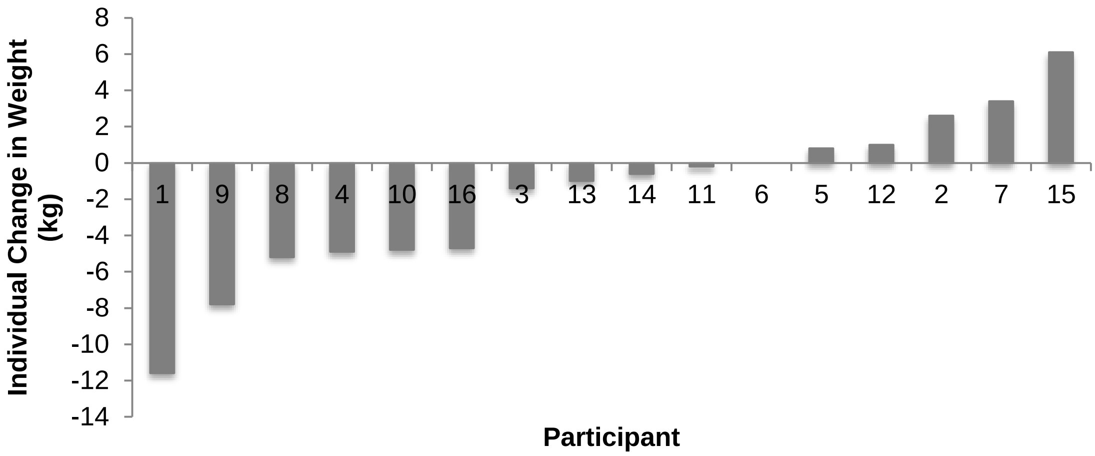


Figure 5-4: Mean weight (kg) and BMI (kg/m^2) between baseline and week 19 (N = 16)

a) Weight



b) Body mass index

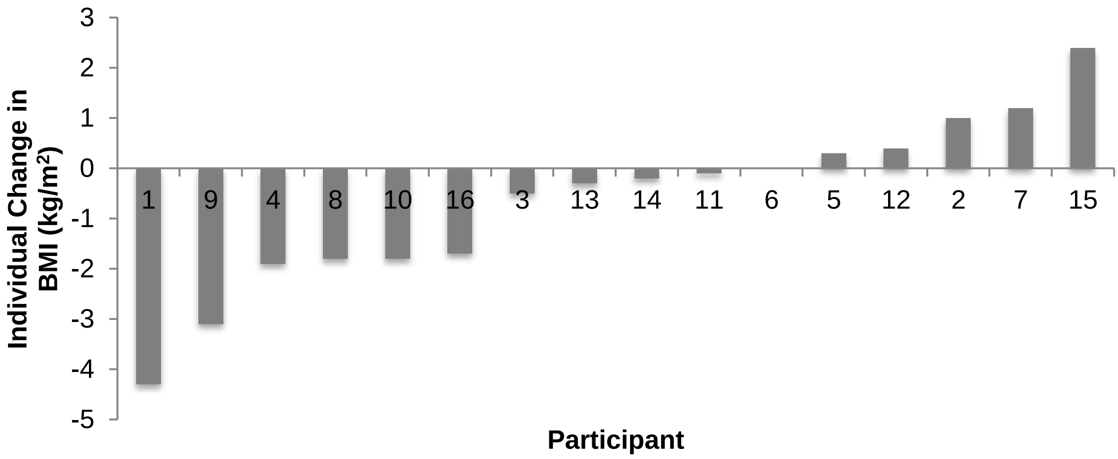


Figure 5-5: Individual change in weight (kg) and BMI (kg/m^2) between baseline and week 19 (N = 16)

Systolic and Diastolic Blood Pressure

Mean systolic and diastolic blood pressure over time is presented in Figure 5-6 and individual change scores are presented in Figure 5-7. Mean change was -3.5mmHg for systolic blood pressure and +0.29mmHg for diastolic blood pressure; these were not statistically significant. Six (38%) participants had a decrease in their systolic blood pressure of ≥10mmHg, with the greatest changes being -21mmHg and -19mmHg. Four (25%) participants had a decrease in their diastolic blood pressure of >5mmHg with the greatest change being -15mmHg.

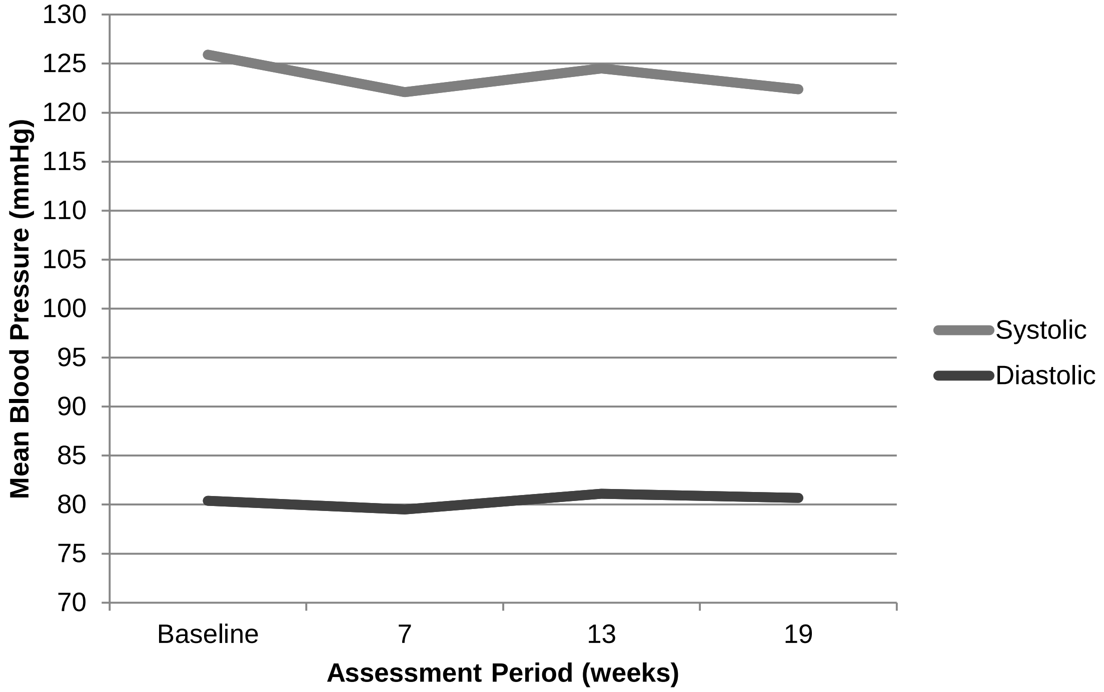
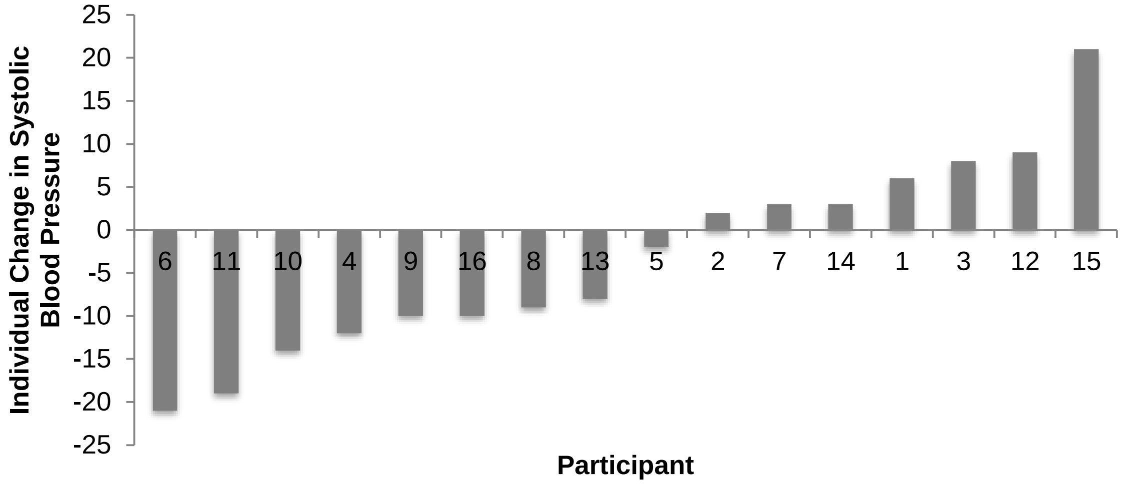


Figure 5-6: Mean systolic and diastolic blood pressure (mmHg) between baseline and week 19 (N = 16)

a) Systolic blood pressure



b) Diastolic blood pressure

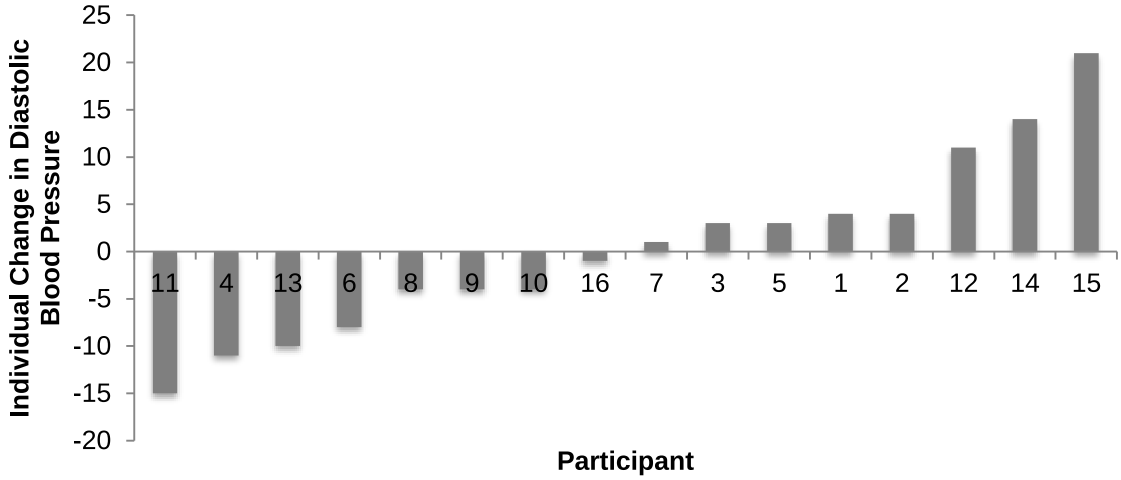


Figure 5-7: Individual change in systolic and diastolic blood pressure (mmHg) between baseline and week 19 (N = 16)

5.3.3.2 Physical activity and sedentary behaviour

Self-Reported Physical Activity

Average self-reported domain specific physical activity over time is presented in Table 5-7. Three participants were excluded from the analysis, as they did not provide post stage one assessment data. Participant ten's time spent in vigorous-intensity activity was truncated to 840 minutes. No other time spent in physical activity was truncated. Median time spent in walking for transport increased by 20 minutes/week, walking for recreation by 30 minutes/week and moderate intensity physical activity by 20 minutes/week, however these changes were not statistically significant. There were no changes in median time spent in MVPA, vigorous intensity yard work and vigorous intensity physical activity.

Table 5-7

Change in domain specific self-reported physical activity duration (weighted minutes/week) after 19 weeks (N = 13)

	BASELINE Median (IQR)	POST ASSESSMENT Median (IQR)	STATISTICS	p value
Walking for transport	40 (17.5 – 120)	60 (15 – 150)	z = 49.5	0.142
Walking for exercise and recreation	60 (0 – 90)	90 (27.50 – 330)	z = 62.5	0.065
Vigorous gardening and yard work	0 (0 – 35)	0 (0 – 120)	z = 21	0.236
Vigorous physical activity	0 (0 – 120)	0 (0 – 55)	z = 13	0.866
Moderate physical activity	0 (0 – 65)	20 (0 – 90)	z = 22	0.575
Total self-reported moderate-vigorous physical activity [a]	180 (55 – 460)	180 (97.5 – 705)	z = 65	0.173

Items reported as median (25^{th} 75^{th} percentile)

[a] Total physical activity excludes vigorous gardening and yard work, and has vigorous activity weighted by two

Mean times for domain specific physical activity are presented in Figure 5-8. Mean time spent in total MVPA at baseline was 245 minutes/week (SD 239.34) and at post assessment 422 minutes/week (SD 466.39), indicating an increase of +177 minutes/week.

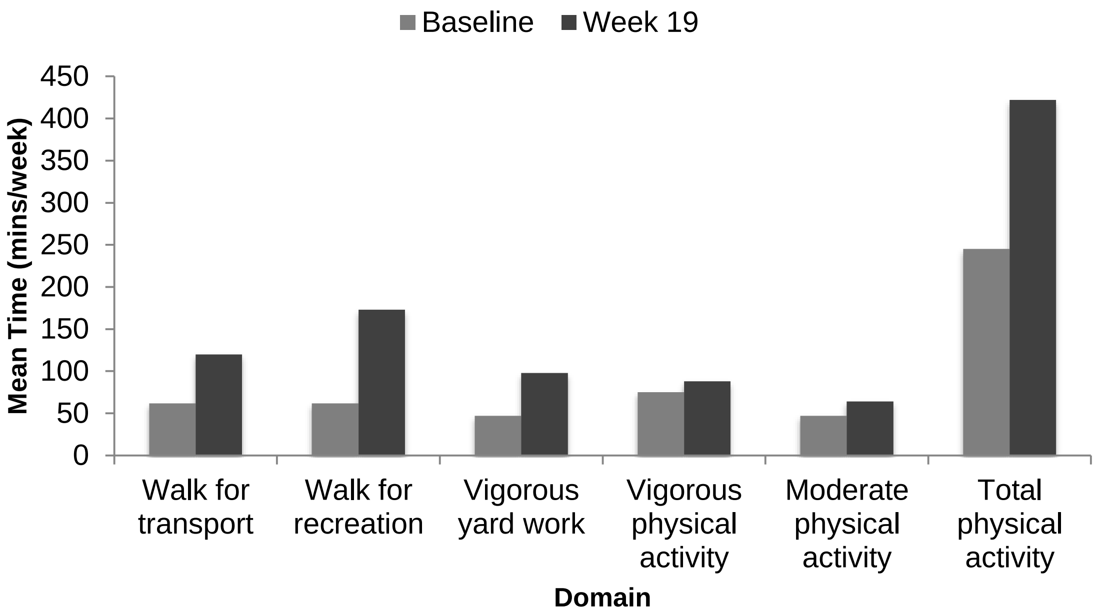


Figure 5-8: Mean domain specific self-report physical activity (weighted minutes/week) at baseline and week 19 (N = 13)

Individual participant change scores for total MVPA are presented in Figure 5-9. Six (46%) participants increased their *total* time spent in MVPA by >100 minutes/week, with the greatest change being +1190 minutes/week. For domain specific physical activity (individual change scores not shown), four (31%) participants increased their *walking for transport* time by >100 minutes/week with the greatest change being +330 minutes/week. Five (38%) participants increased their *walking for recreation* time by >100 minutes/week with the greatest change being +450 minutes/week. Four (31%) participants increased their time in *vigorous yard work* by >100 weighted minutes/week, with the greatest change in time being +680 minutes/week. One participant increased their time spent in *vigorous intensity physical activity* by >100 weighted minutes/week and two participants increased their time spent in *moderate intensity physical activity* by >100 minutes/week with the greatest change in time being +320 minutes/week.

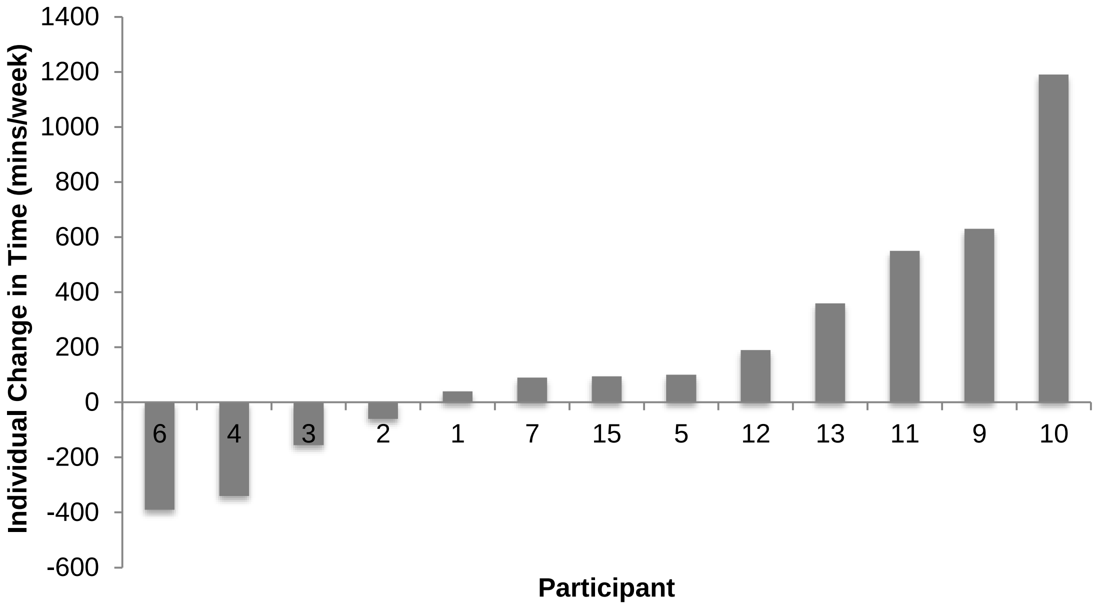


Figure 5-9: Individual change in total self-report physical activity between baseline and week 19 (minutes/week) (N = 13)

Self-Reported Sedentary Behaviour

Domain specific self-reported weekday and weekend day sedentary behaviour over time are presented in Table 5-8. Data from three participants were excluded from the analysis, as there was no post stage one assessment data. No sedentary behaviour data were truncated. There were decreases in *total* sedentary behaviour (90 minutes on a weekday and 120 minutes on a weekend day), leisure time and sitting on a weekday (60 minutes) and watching television on a weekend day (60 minutes), but these changes were not statistically significant. There was a non statistically significant increase of 60 minutes in median time spent watching television on a weekday. There was no change in using a computer/smart phone on a weekday or sitting during leisure time on a weekend day.

Table 5-8

Change in domain specific self-reported weekday and weekend day sedentary behaviour duration (minutes/day) after 19 weeks (N= 13)

	BASELINE	POST ASSESSMENT	STATISTICS	
	Median (IQR)	Median (IQR)		p value
Weekday				
Watching television	120 (75 – 180)	180 (120 – 210)	z = 49	0.150
Using a computer / smart phone (not at work)	120 (75 – 180)	120 (60 – 210)	z = 26	0.260
Leisure time [1]	120 (30 – 300)	60 (15 – 120)	z = 18.5	0.197
Total sedentary behaviour time	420 (300 – 600)	330 (255 – 605)	t(12) = -.0233	0.820
Weekend day				
Watching television	180 (90 – 285)	120 (120 – 270)	z = 19.5	0.719
Using a computer / smart phone (not at work)	60 (45 – 180)	120 (15 – 255)	z = 30	0.370
Leisure time [1]	120 (45 – 360)	120 (60 – 180)	t(12) = 0.899	0.387
Total sedentary behaviour time	480 (420 – 645)	360 (285 – 600)	t(12) = 0.619	0.548

Items reported as median (25^{th} 75^{th} percentile)

[1] Leisure time: NOT including television (e.g. visiting friends, movies, dining out etc.)

Mean times for domain specific weekday and weekend day sedentary behaviour are presented in Figure 5-10. Mean time spent in total sedentary behaviour on a weekday at baseline was 444 minutes/day (SD 201.35) and at post assessment 460 minutes/day (SD 297.49). Mean time spent in total sedentary behaviour on a weekend day at baseline was 503 minutes/day (SD 166.65) and at post assessment 467 minutes/day (SD 237.22).

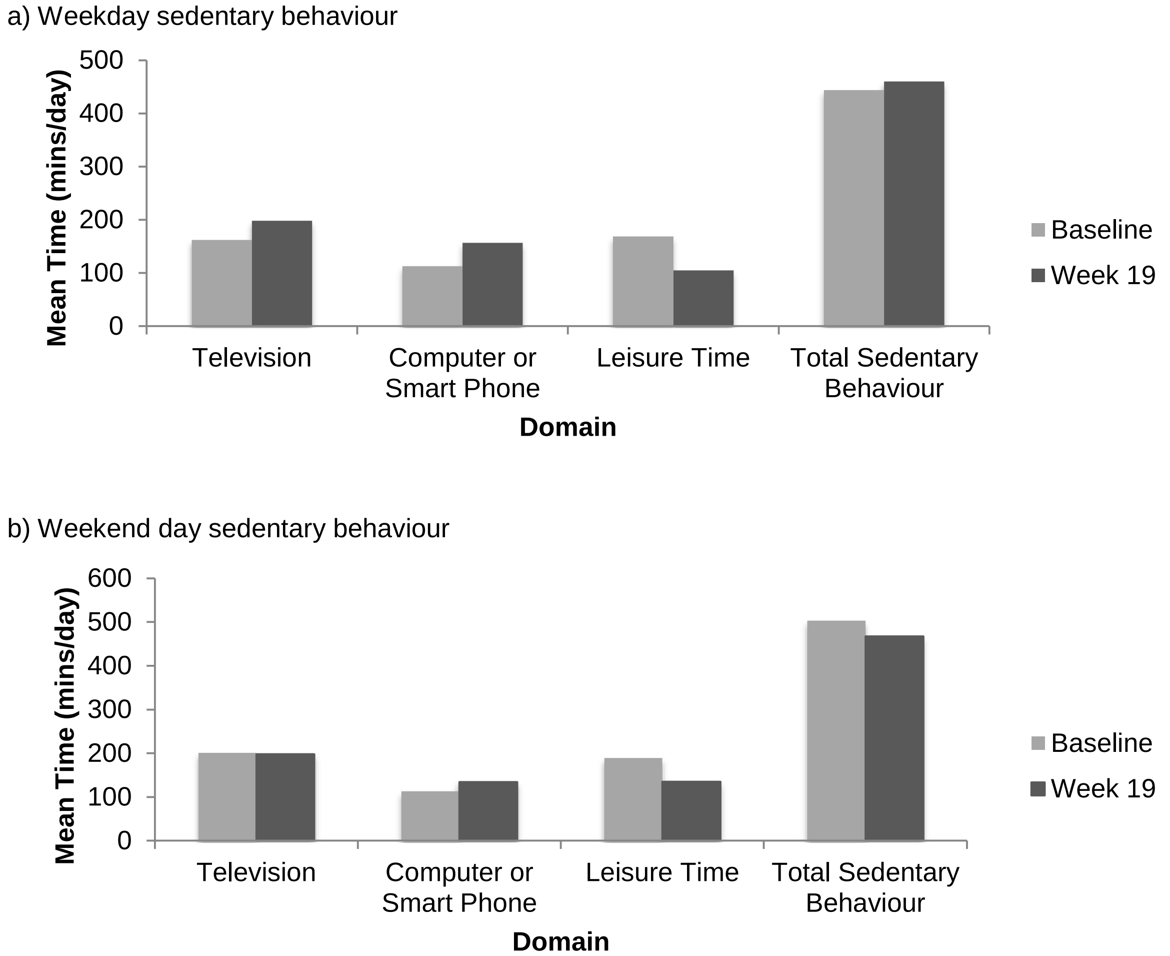
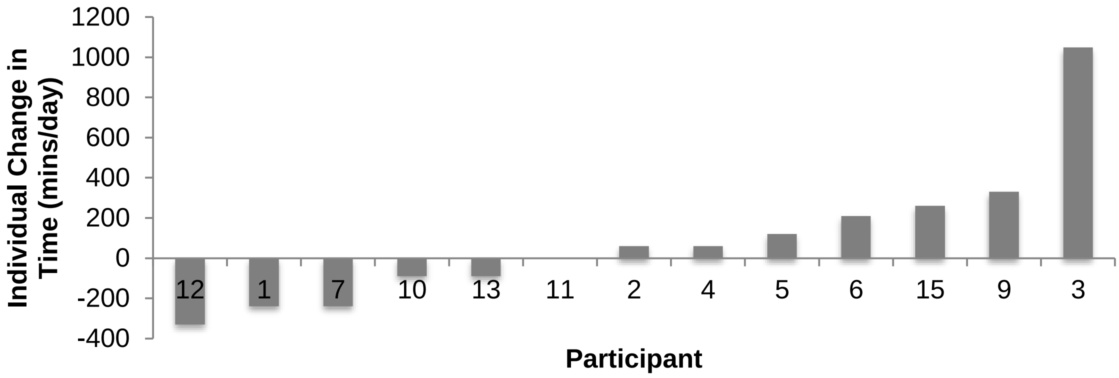


Figure 5-10: Mean self-reported sedentary behaviour at baseline and week 19 (minutes/day) (N = 13)

Individual participant change scores for total sedentary behaviour are presented in Figure 5-11. Five (38%) participants decreased their *total* time spent in sedentary behaviour time on a weekday, with the greatest change being -330 minutes/day, and five (38%) participants decreased their time on a weekend day, with the greatest change being -450 minutes/day. For domain specific sedentary behaviour (individual changes scores not shown), four (31%) participants decreased their *watching television* time by 60 minutes/day on a weekday, and five (38%) participants decreased their time by ≥60 minutes/day on a weekend day with the greatest change at -120 minutes/day. Three (23%) participants decreased their *using a computer/smart phone* time by 60 minutes/day on a weekday and three participants decreased their time by ≥60 minutes/day on a weekend day with the greatest change being -180 minutes/day. Seven (54%) participants decreased their *leisure time* sitting time by ≥ 60 minutes/day on a weekday with the greatest change in time being -420 minutes/day, and six (46%) participants decreased their time by ≥ 60 minutes/day on a weekend day with the greatest change being -450 minutes/day.

a) Total sedentary behaviour (weekday)



b) Total sedentary behaviour (weekend day)

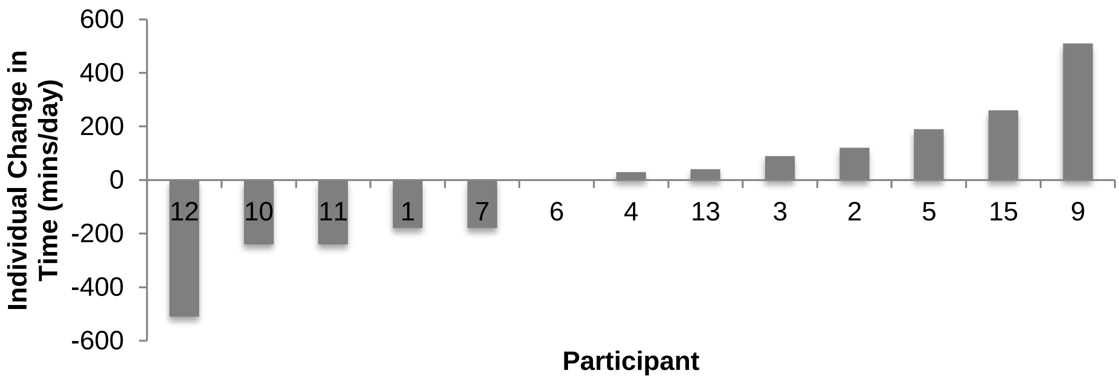


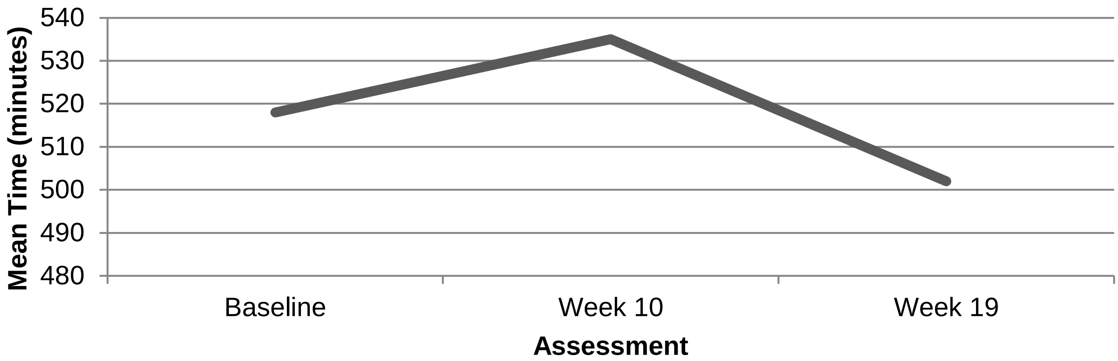
Figure 5-11: Individual change in total self-report sedentary behaviour between baseline and week 19 (minutes/day) (N = 13)

Objective sedentary behaviour and physical activity

Mean objectively assessed sedentary behaviour, low-intensity physical activity and moderate- to vigorous physical (MVPA) activity over time are presented in Figure 5-12. Five participants were excluded from the analysis. Reasons included invalid accelerometry wear time at all assessment points (n = 1); declined to wear the accelerometer due to poor physical health at post assessment (n = 1); declined to wear the accelerometer due to poor mental health at baseline (n = 1) and at mid and post assessment (n = 1) and did not return the accelerometer for analysis at post assessment (n = 1).

Mean sedentary behaviour at baseline was 519 minutes/day (SD 43.33) and at post assessment 502 minutes/day (SD 41.14), with a non-significant mean decrease of 17 minutes/day ($t(10) = 1.353$, $p = 0.206$). Mean light-intensity physical activity at baseline was 151 minutes/week (SD 31.51) and at post assessment 135 minutes/day (SD 44.12), with a non-significant mean decrease of 16 minutes/day ($t(10) = 1.503$, $p = 0.164$). Mean MVPA at baseline was 23 minutes/day (SD 15.51) and at post assessment 25 minutes/day (SD 15.23), with a non-significant mean increase of 2 minutes/day ($t(10) = -0.383$, $p = 0.710$).

a) Sedentary behaviour



b) Moderate- to vigorous-intensity physical activity

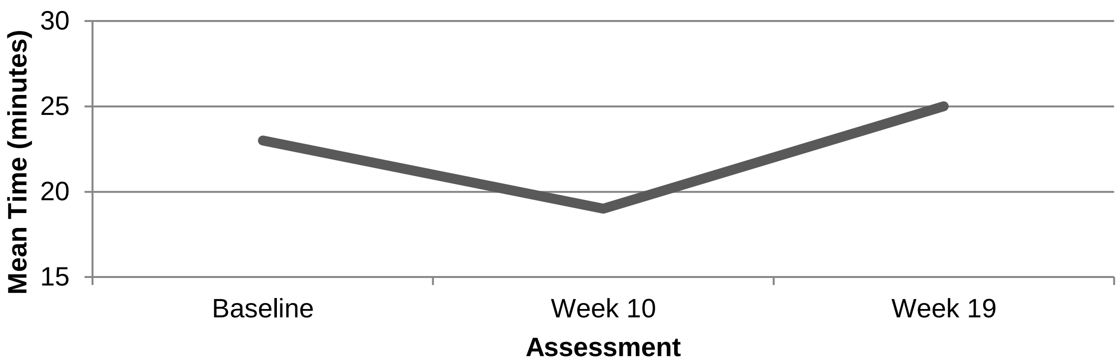
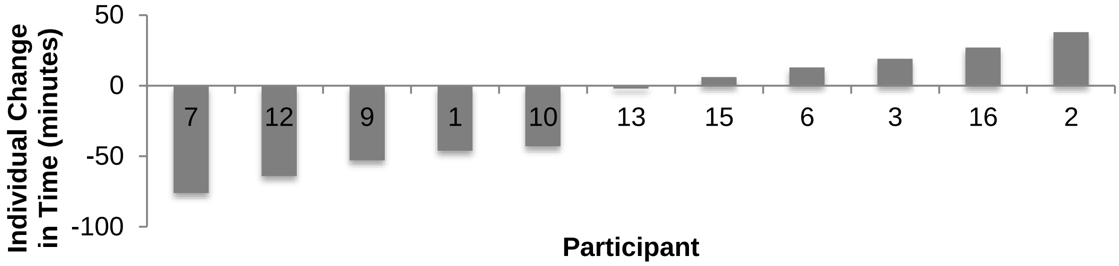


Figure 5-12: Mean objective sedentary behaviour and moderate- to vigorous-intensity physical activity between baseline and week 19 (minutes/day) (N = 11)

Participants' individual change scores for objective sedentary behaviour and physical activity over time are presented in Figure 5-13. Five (45%) participants decreased their sedentary behaviour by ≥40 minutes/day with the greatest change being -76 minutes/day. Two participants had notable increases in time spent in MVPA: one had an increase of +25 minutes/day and another had an increase of +27 minutes/day. Among those who *decreased* time spent in MVPA over time, the greatest change was -10 minutes/day. Two participants (eight and fourteen) were excluded from the analysis due to the absence of post assessment data. Both participants, however, provided midpoint accelerometry data at week ten. One had an increase of 24 minutes/day in MVPA, and the other had an increase of 35 minutes/day in MVPA.

a) Sedentary behaviour



b) Moderate- to vigorous-intensity physical activity

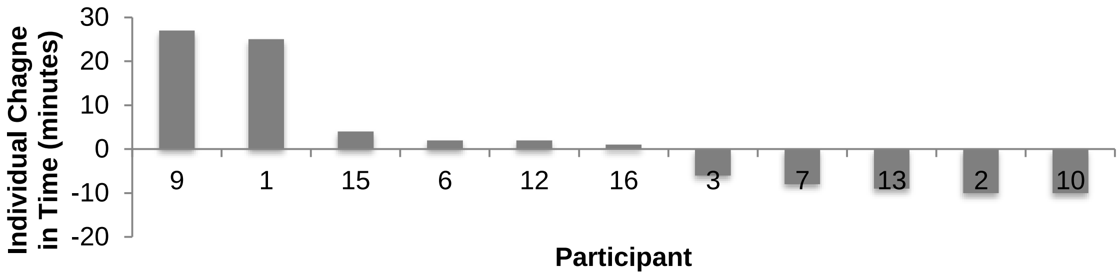


Figure 5-13: Individual change in domain specific objective sedentary behaviour and moderate- to vigorous-intensity physical activity (minutes/day) between baseline and week 19 (n = 11)

5.3.3.3 Psychological wellbeing

A summary of the psychological wellbeing results between baseline and stage one post assessment is presented in Table 5-9.

Table 5-9

Change in psychological wellbeing after 19 weeks

Outcome measure		Baseline	Post stage one study		Statistics	
		Mean (SD)	**Mean (SD)**	**Mean change (95% CI)**		**p value**
DASS 21	Depression	21.87 (9.46)	17.07 (9.77)	-4.8 (-9.96, 0.36)	t(14) = 1.996	0.066
	Anxiety	13.60 (10.34)	9.73 (6.84)	-3.9 (-8.52, 0.79)	t(14) = 1.783	0.096
	Stress	18.40 (8.29)	15.47 (8.50)	-2.9 (-6.43, 0.57)	t(14) = 1.798	0.094
WHOQOL-Bref	Physical	46.64 (21.16)	48.36 (20.16)	1.72 (-11.60, 15.03)	t(13) = -0.278	0.785
	Psychological	33.50 (18.97)	42.64 (22.34)	9.14 (-0.10, 18.18)	t(13) = -2.185	0.048
	Social Relationships	50.50 (26.96)	53.14(23.84)	2.64 (-6.73, 12.02)	t(13) = -0.609	0.553
	Environmental	62.21 (13.81)	67.14 (13.81)	4.93 (0.001, 9.86)	t(13) = -2.161	0.050

Depression, Anxiety and Stress (DASS 21)

Mean DASS 21 scores over time are presented in Figure 5-14. One participant was excluded from the analysis, as there was no data post week seven. Non-significant decreases (i.e. improvements) were observed for depression, anxiety and stress.

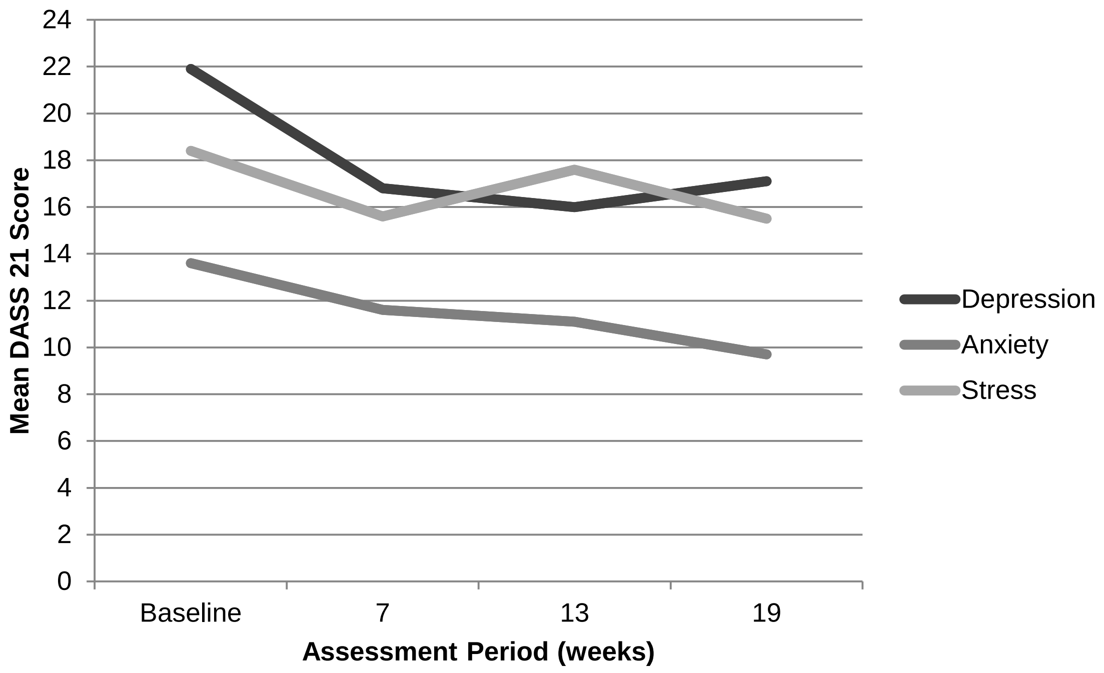


Figure 5-14: Mean DASS 21 scores between baseline and week 19 (N = 15)

Participants' individual change scores for depression, anxiety and stress over time are presented in Figure 5-15. The majority (80%) of participants had lower depression scores with seven participants decreasing by ≥10. Nine (60%) participants had decreased anxiety scores, with three participants decreasing by ≥10. Ten (67%) participants had a decrease in their anxiety scores, with two participants decreasing by 12.

a) Depression

b) Anxiety

c) Stress

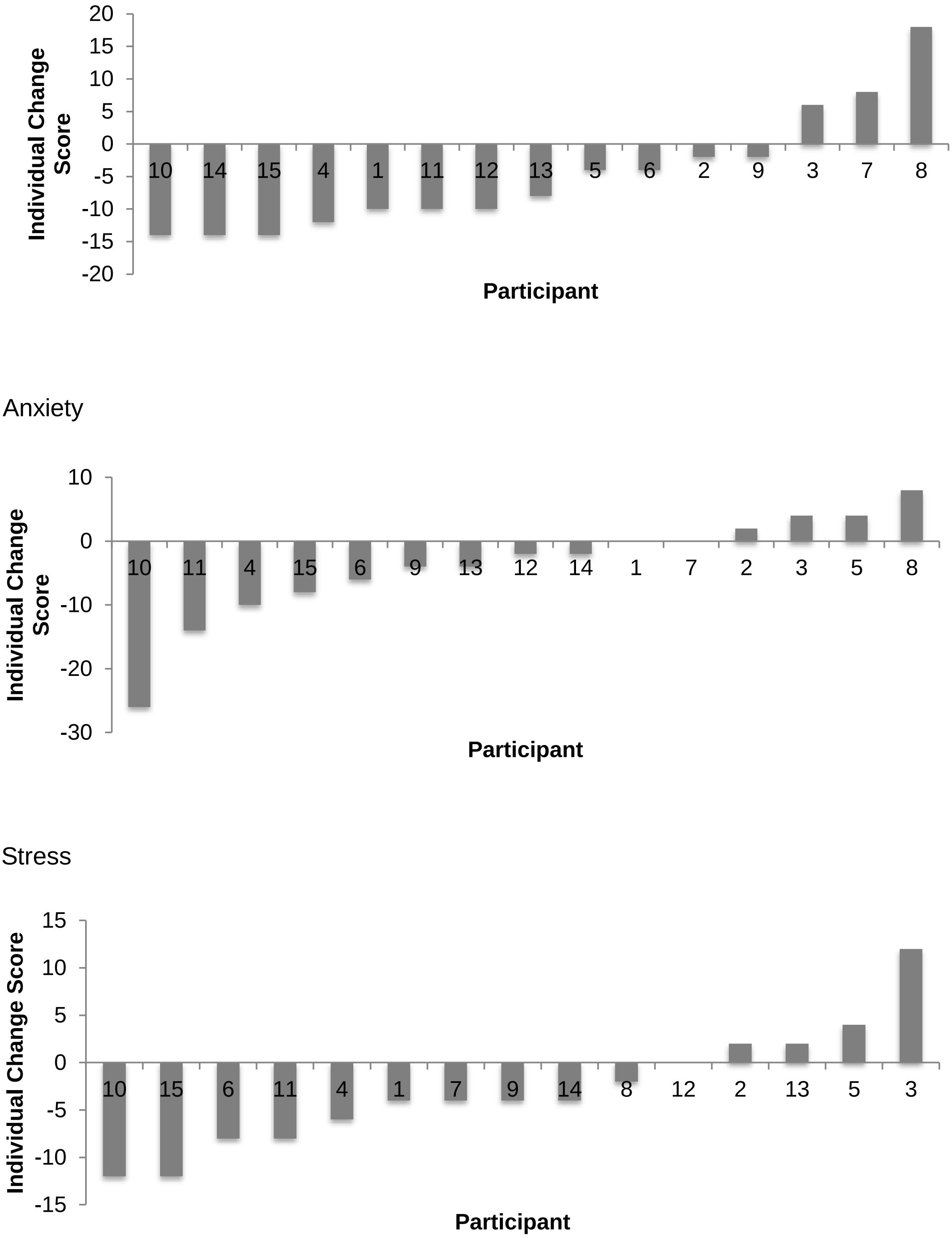


Figure 5-15: Individual change in DASS 21 scores between baseline and week 19 (N = 15)

World Health Organisation Quality of Life (WHOQOL) - Bref

Mean WHOQOL-Bref scores over time are presented in Figure 5-16. Two participants were excluded from the analysis, as they did not provide post stage one assessment data. There was a statistically significant increase in psychological health, and non-significant changes in physical health, environmental and social relationships scores.

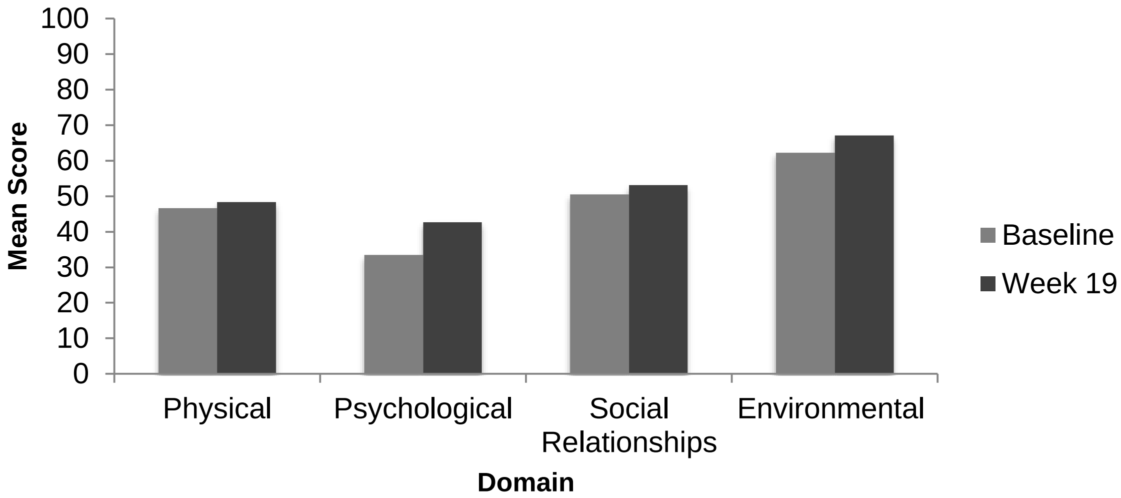


Figure 5-16: Mean WHOQOL-Bref scores between baseline and week 19 (N = 14)

Participants' individual change scores for the WHOQOL-Bref domains over time are presented in Figure 5-17. The physical health of six participants improved over time. For the majority of participants, their psychological and environmental health improved. In the social relationships domain, scores of six participants improved.

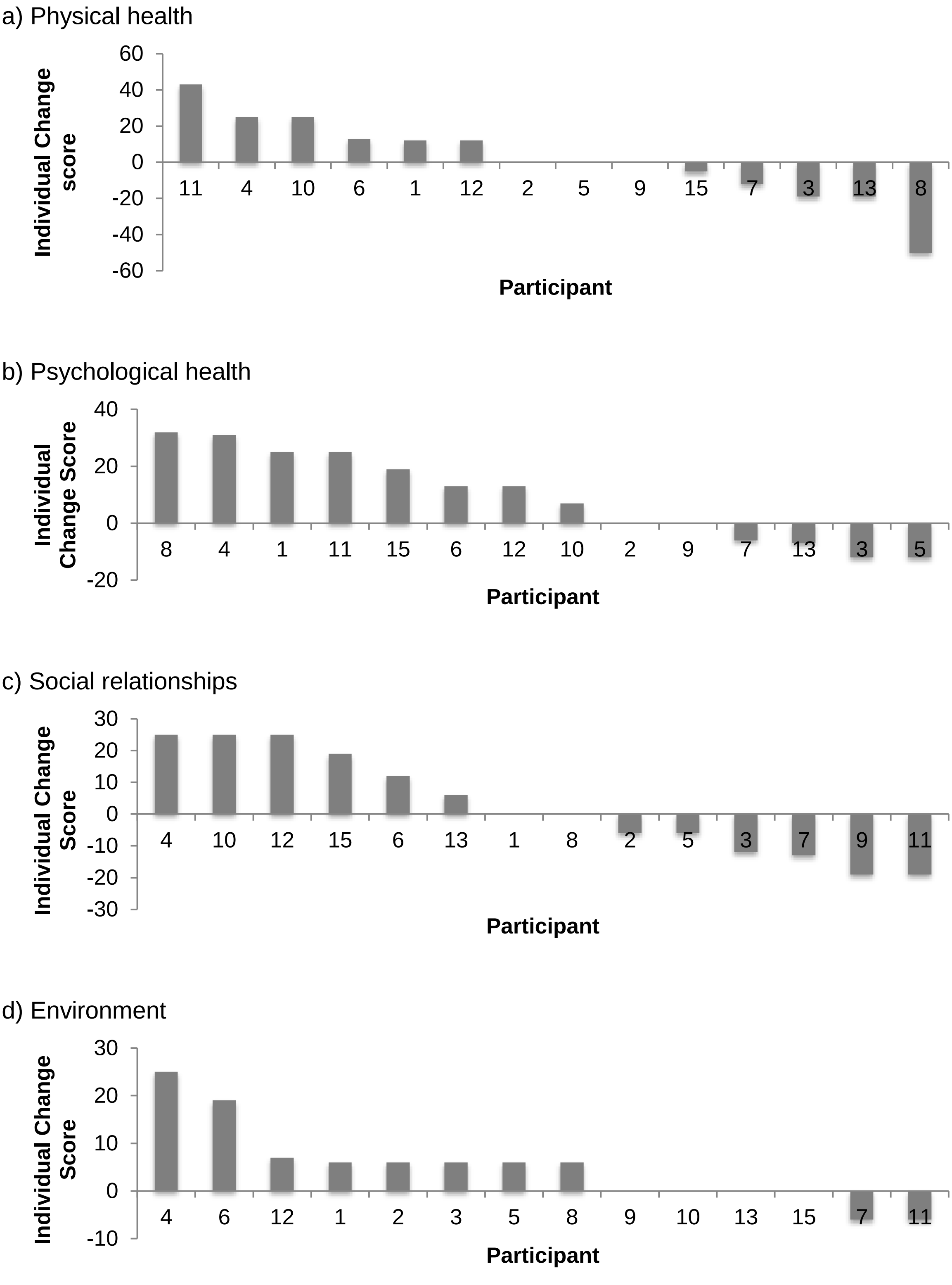


Figure 5-17: Individual change in WHOQOL-Bref scores between baseline and week 19 (n = 14)

5.3.4 Stage Two Results

5.3.4.1 Metabolic health indicators

Ten participants completed stage two of the intervention (31 weeks). A summary of the metabolic health indicators results between baseline and stage two post assessment are presented in Table 5-10.

Table 5-10

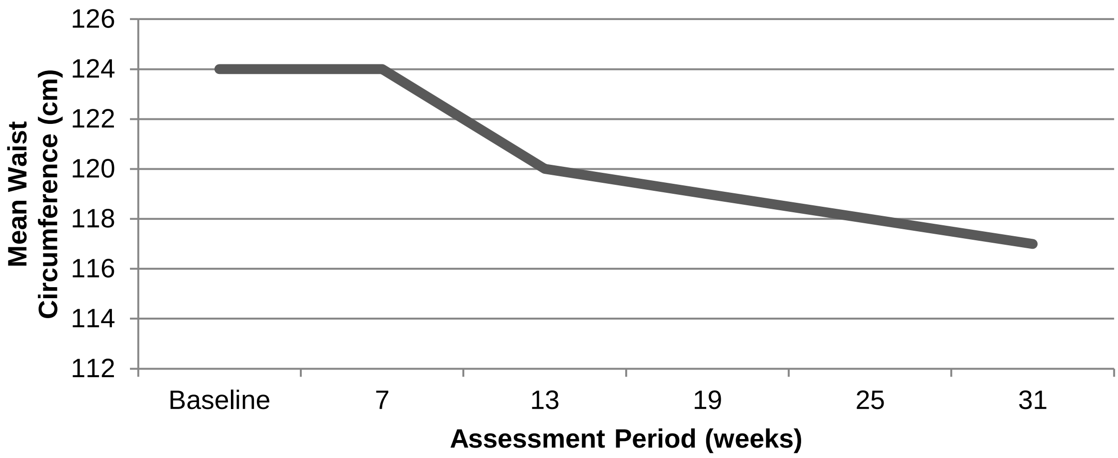
Change in metabolic health indicators after 31 weeks (N = 10)

Outcome measure	Baseline	Post stage two study		Statistics	
	Mean (SD)	**Mean (SD)**	**Mean change (95% CI)**		**p value**
Waist circumference (cm)	124 (9.10)	116.9 (14.72),	-7.1 (-12.93, -1.17)	$t(9) = 2.711$	0.024
Waist to height ratio	0.74 (0.054)	0.70 (0.078)	-0.04 (-0.797, -0.004)	$t(9) = 2.522$	0.033
Weight (kg)	103.4 (15.16)	97.8 (19.67),	-5.51 (-9.95, -1.07)	$t(9) = 2.522$	0.033
BMI (kg/m^2)	36.5 (4.70)	34.4 (5.64)	-2.07 (-3.76, -0.38)	$t(9) = 2.771$	0.022
Systolic blood pressure (mmHg)	123.3 (13.12)	119.4 (9.95)	-3.9 (-10.74, 2.94)	$t(9) = 1.290$	0.229
Diastolic blood pressure (mmHg)	81 (5.68)	81.9 (8.22)	0.9 (-2.25, 4.05)	$t(9) = -0.646$	0.535

Primary Outcomes: Waist Circumference and Waist to Height Ratio

Mean waist circumference and waist to height ratio over time are presented in Figure 5-18 and individual change scores are presented in Figure 5-19. There was a statistically significant mean decrease in waist circumference of 7.1cm and in waist to height ratio of 0.04 points. The majority (80%) of participants had a decrease in their waist circumference with half having a decrease of 5cm or greater. The greatest changes in waist circumference were -21.5cm and -21cm. Seven (70%) participants had a decrease in their waist to height ratio with the greatest changes being –0.14 and -0.13.

a) Waist Circumference



b) Waist to Height Ratio

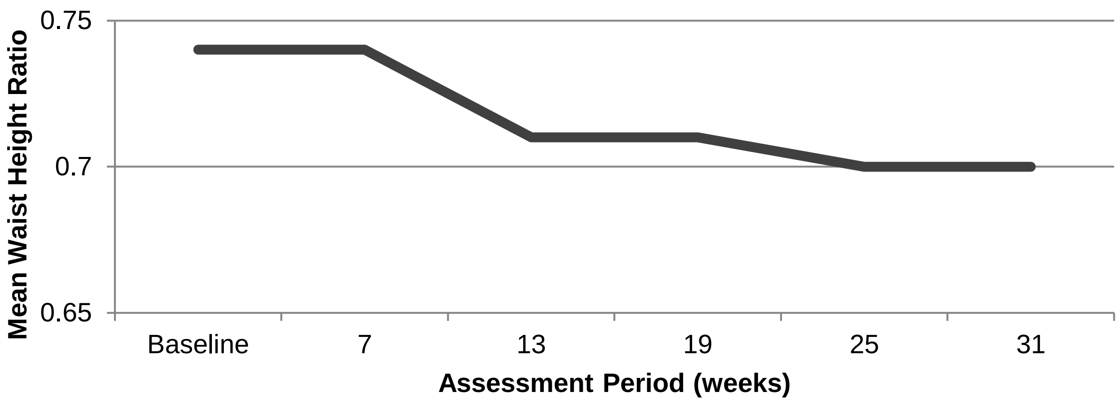
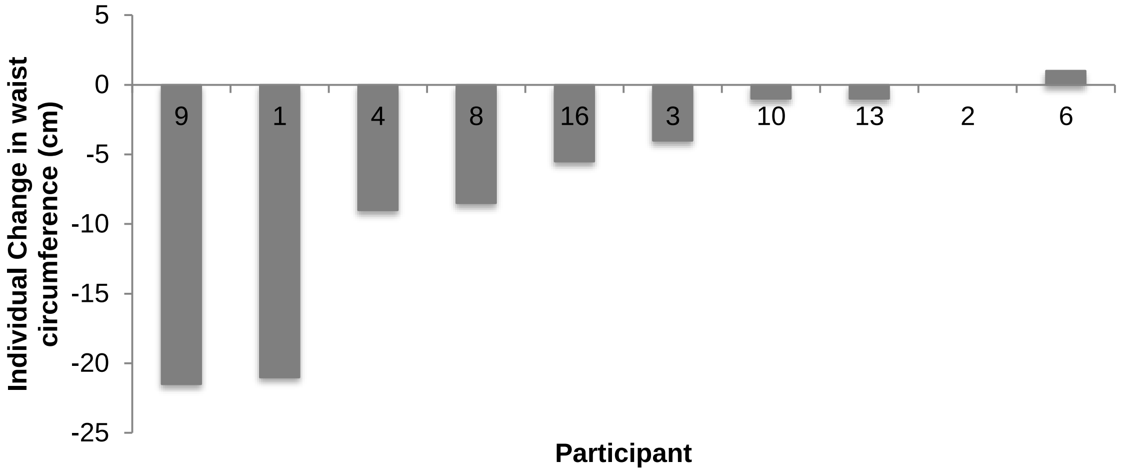


Figure 5-18: Mean waist circumference (cm) and waist to height ratio between baseline and week 31 (N = 10)

a) Waist Circumference



b) Waist to Height Ratio

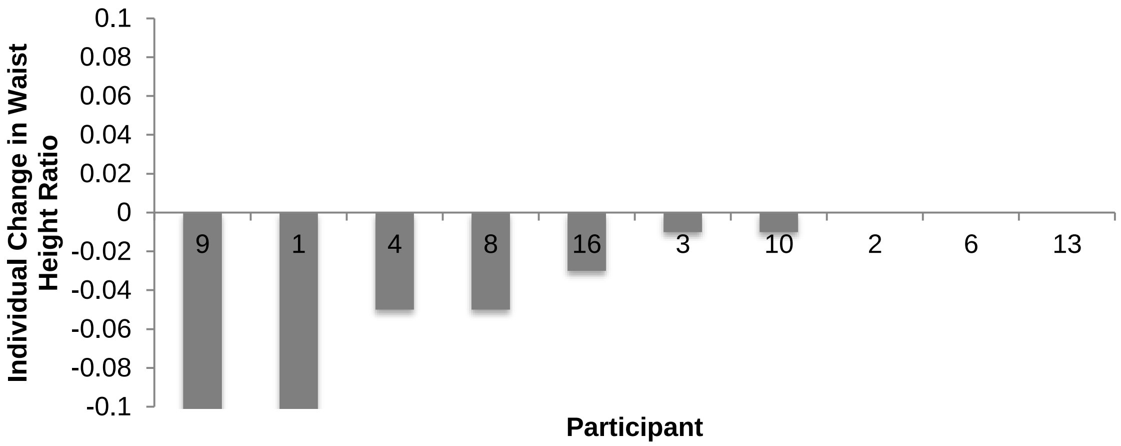
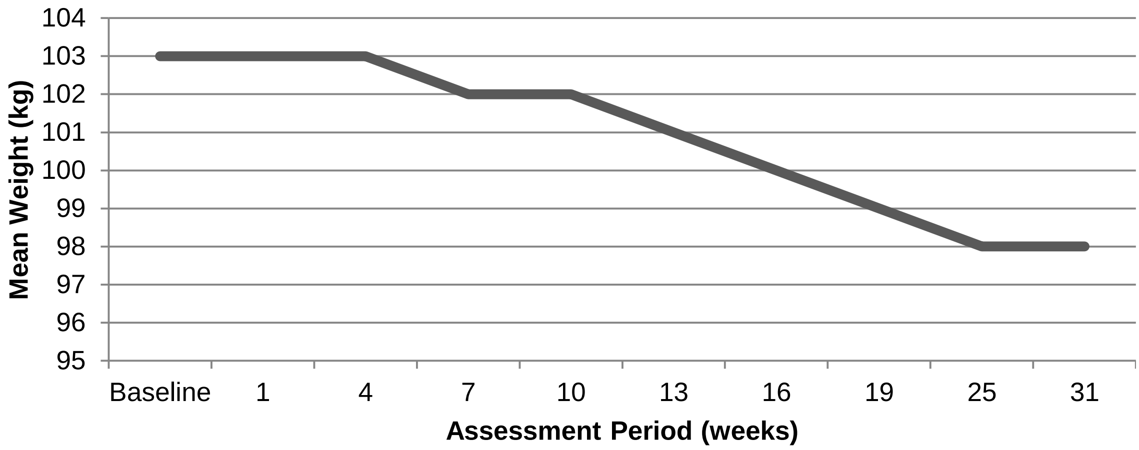


Figure 5-19: Individual change in waist circumference (cm) and waist to height ratio between baseline and week 31 (N = 10)

Weight and Body Mass Index

Mean weight and body mass index (BMI) over time are presented in Figure 5-20 and individual change scores are presented in Figure 5-21. There were statistically significant mean decreases in weight and BMI of 5.6kg and 2.1kg/m^2 respectively. Six participants (60%) had a weight loss of more than 5.0kg with the greatest change in a participant's weight being -14.3kg. All six of these participants lost ≥5% of their total body weight. Six (60%) participants had a decrease in BMI greater than 1.5 with the greatest changes being -5.3 and -5.4.

a) Weight



a) Body Mass Index

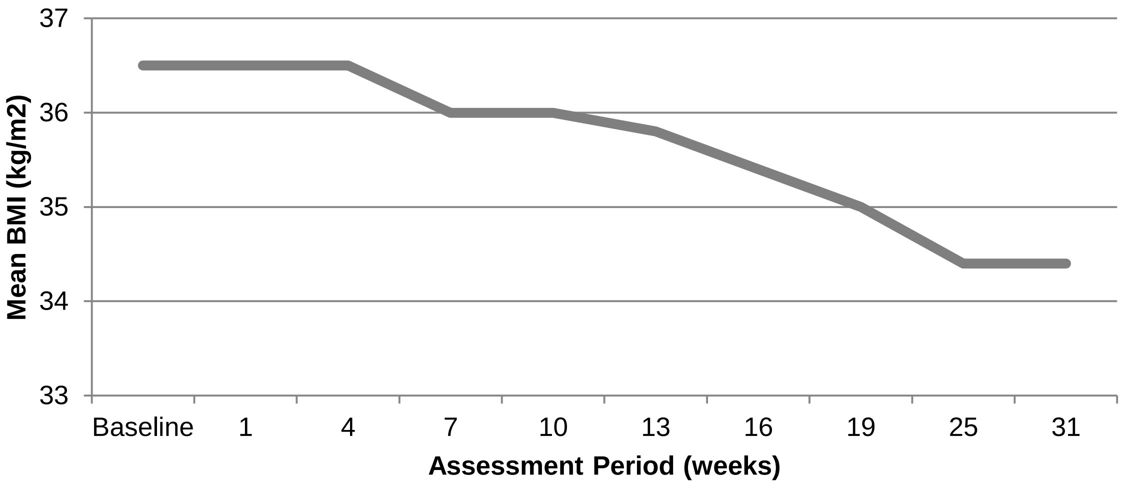
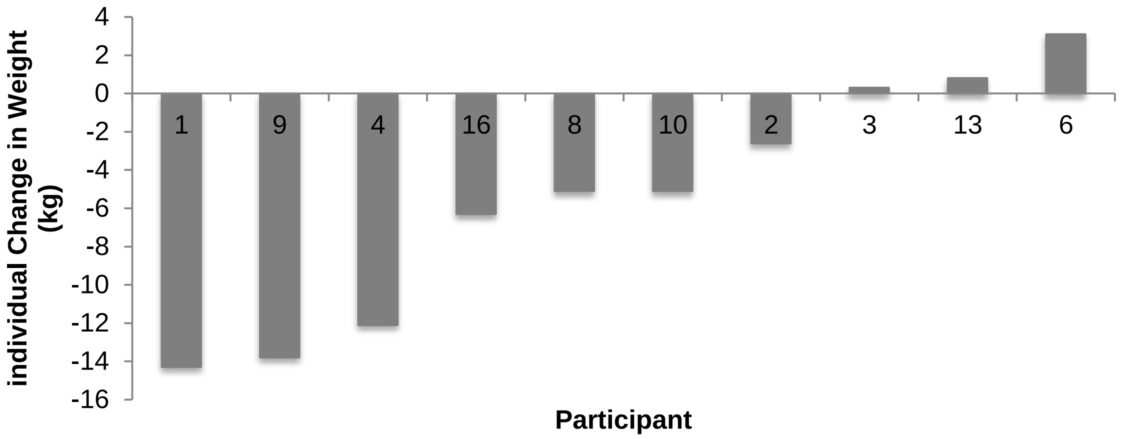


Figure 5-20: Mean weight (cm) and BMI (kg/m^2) between baseline and week 31 (N = 10)

a) Weight



b) Body Mass Index

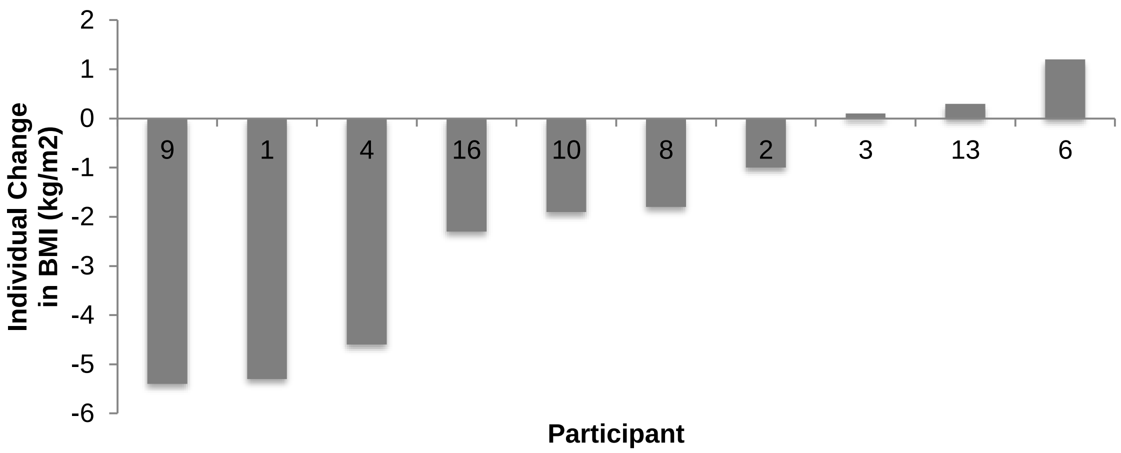


Figure 5-21: Individual change in weight (kg) and BMI (kg/m^2) between baseline and week 31 (N = 10)

Systolic and Diastolic Blood Pressure

Mean systolic and diastolic blood pressure over time is presented in Figure 5-22 and individual change scores are presented in Figure 5-23. Mean change was -3.9mmHg for systolic blood pressure and +0.90mmHg for diastolic blood pressure, which were not statistically significant. Three participants had a decrease in systolic blood pressure of ≥10mmHg with the greatest change being –17mmHg. One participant had a decrease in diastolic blood pressure of >5mmHg (-6mmHg).

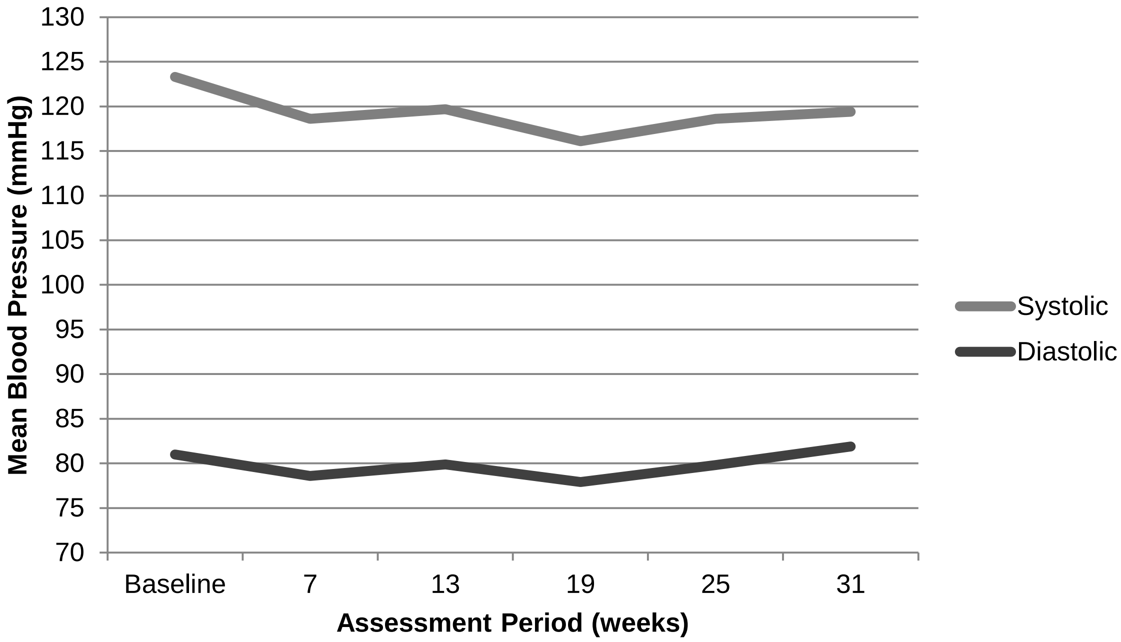
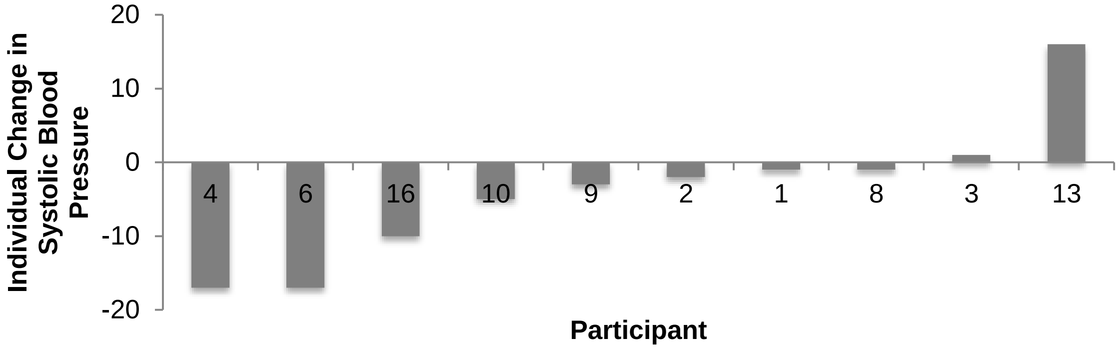


Figure 5-22: Mean systolic and diastolic blood pressure between baseline and week 31 (N = 10)

a) Systolic blood pressure



b) Diastolic blood pressure

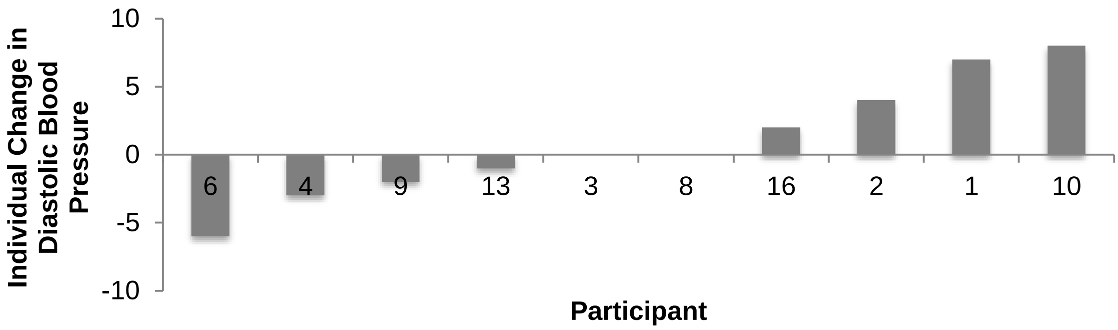


Figure 5-23: Individual change in systolic and diastolic blood pressure between baseline and week 31 (N = 10)

5.3.4.2 Physical activity and sedentary behaviour

Self-Report Physical Activity

Mean self-reported domain specific physical activity over time is presented in Table 5-11. Three participants were excluded from the analysis, as they did not provide post stage two data. No time spent in physical activity was truncated. The changes in physical activity were not statistically significant. There were decreases in MVPA (mean change 135 minutes/week) and median time spent in *walking for transport* (40 minutes/week), and *walking for recreation* (80 minutes/week). There were no changes observed in median time spent in vigorous intensity yard work, vigorous intensity physical activity, and moderate intensity physical activity

Table 5-11

Change in domain specific self-reported physical activity duration (minutes/week) after 31 weeks (N=7)

	BASELINE	POST STAGE TWO	STATISTICS	
	Median (IQR)	Median (IQR)		p-value
Walking for transport	40 (15 – 150)	0 (0 – 0)	t(6) = 0.188	0.857
Walking for exercise and recreation	80 (0 – 90)	0 (0 – 45)	z = 6	0.686
Vigorous gardening and yard work	0 (0 – 30)	0 (0 – 360)	z = 6	0.715
Vigorous physical activity	0 (0 – 160)	0 (0 – 0)	z = <0.001	0.109
Moderate Physical activity	0 (0 – 150)	0 (0 – 0)	z = <0.001	0.109
Total self-reported moderate-vigorous physical activity [a]	225 (150 – 495)	90 (40 -240)	t(6) = 1.547	0.173

Items reported as median (25^{th} 75^{th} percentile)

[a] Total physical activity excludes vigorous gardening and yard work, and has vigorous activity weighted by two

Mean time for domain specific physical activity is presented in Figure 5-24. Mean time spent in total MVPA at baseline was 326 minutes/week (SD 268.58) and at post assessment 132 minutes/week (SD 128.58), indicating a change of -149 minutes/week.

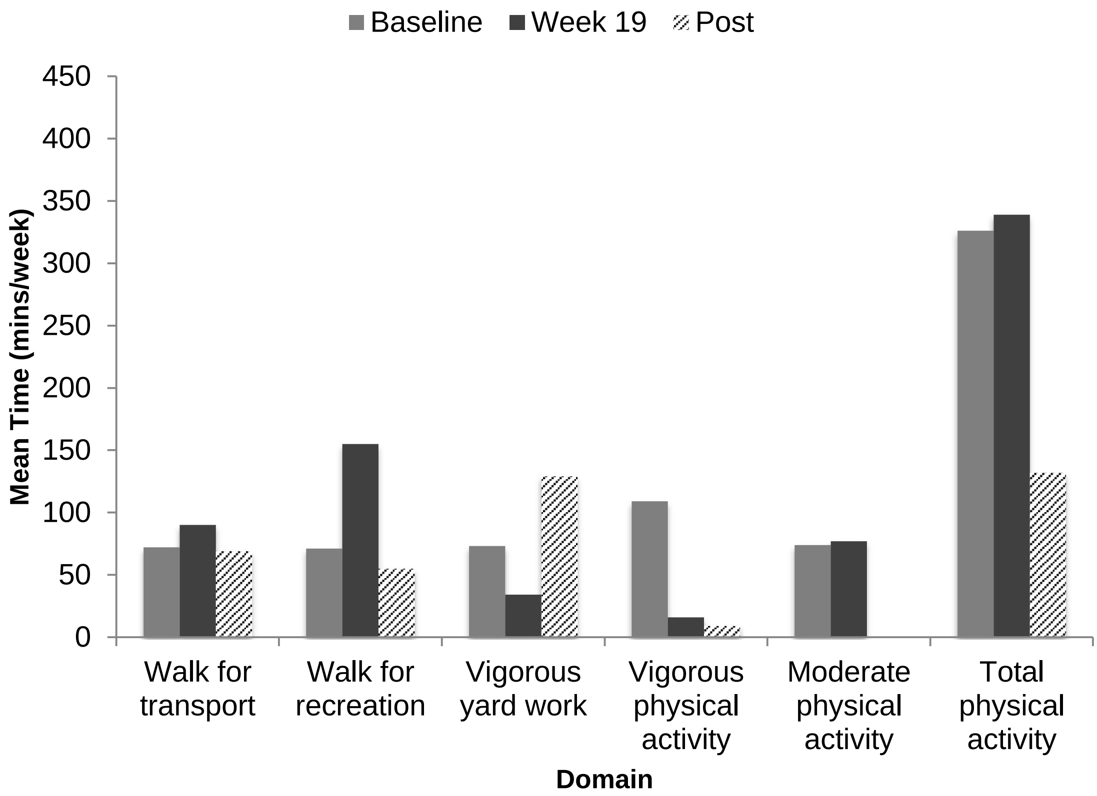


Figure 5-24: Mean domain specific self-report physical activity (weighted minutes/week) at baseline and weeks 19 and 31 (N = 7)

For *total* time spent in MVPA (individual change scores not shown), three participants increased their time by >30 minutes/week, with the greatest change being +135 minutes/week. For each of the domains *walking for transport and walking for recreation,* two participants increased their time by >30 minutes/week. Three participants increased their time by >100 minutes/week in the domain *vigorous yard work*. For the domains *vigorous intensity and moderate intensity physical activity,* there were no increases in time between baseline and stage two assessment.

Self-Report Sedentary Behaviour

Domain specific self-reported weekday and weekend day sedentary behaviour over time is presented in Table 5-12. Three participants were excluded from the analysis, as they did not provide post stage two assessment data. No time spent in sedentary behaviour was truncated. No statistically significant changes in sedentary behaviour were observed. Total sedentary behaviour decreased by 60 minutes on a weekday and increased by 60 minutes on a weekend day. Median time spent watching television increased by 30 minutes on a weekday and by 60 minutes on a weekend day. There was an increase of 120 minutes/day in median time spent using a computer/smart phone on both a weekday and weekend day. Time spent sitting during leisure time decreased by 60 minutes on a weekday and remained unchanged on a weekend day.

Table 5-12

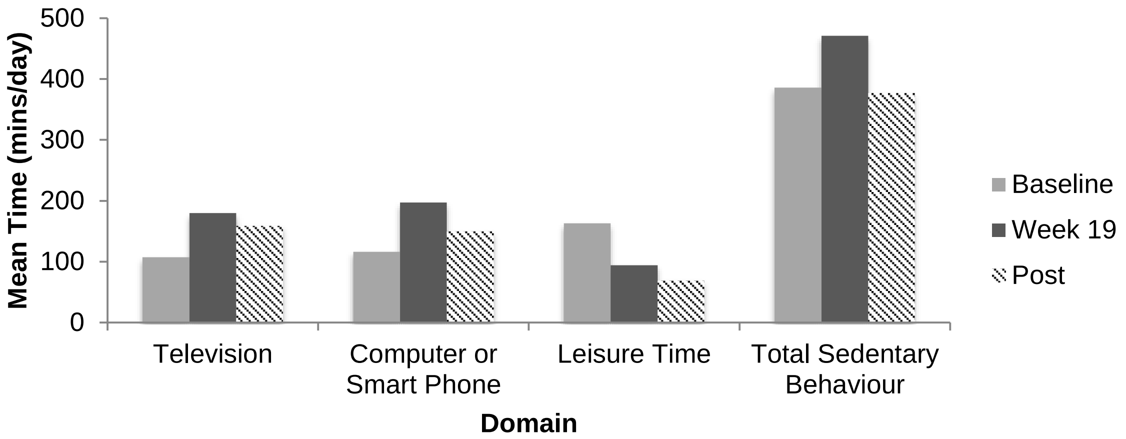
Change in domain specific self-reported weekday and weekend day sedentary behaviour duration (minutes/day) after 31 weeks (N=7)

	BASELINE Median (IQR)	POST ASSESSMENT Median (IQR)	STATISTICS	p-value
Weekday				
While watching television	90 (60 – 180)	120 (120 – 180)	t(6) = -2.048	0.086
Using a computer / smart phone (not at work)	60 (30 – 180)	180 (60 – 240)	t(6) = -0.769	0.471
In your leisure time, NOT including television (e.g. visiting friends, movies, dining out etc.)	60 (0 – 360)	0 (0 – 180)	t(6) = 0.177	0.856
Total sedentary behaviour time	420 (270 – 540)	360 (240 – 540)	t(6) = 0.177	0.856
Weekend day				
While watching television	120 (60 – 330)	180 (120 – 240)	t(6) = -1.170	0.286
Using a computer / smart phone (not at work)	60 (30 – 180)	180 (60 – 240)	t(6) = -0.712	0.503
In your leisure time, NOT including television (e.g. visiting friends, movies, dining out etc.)	60 (0 – 360)	60 (0 – 180)	t(6) = 0.834	0.436
Total sedentary behaviour time	420 (300 – 630)	480 (240 – 720)	t(6) = -0.392	0.709

Items reported as median (25^{th} 75^{th} percentile)

Mean times for domain specific weekday and weekend day sedentary behaviour are presented in Figure 5-25. Mean time spent in total sedentary behaviour on a weekday at baseline was 386 minutes/day (SD 157.25) and at post assessment 377 minutes/day (SD 150.86). Mean time spent in total sedentary behaviour on a weekend day at baseline was 454 minutes/day (SD 185.28) and at post assessment 476 minutes/day (SD 209.59).

a) Weekday sedentary behaviour



b) Weekend day sedentary behaviour

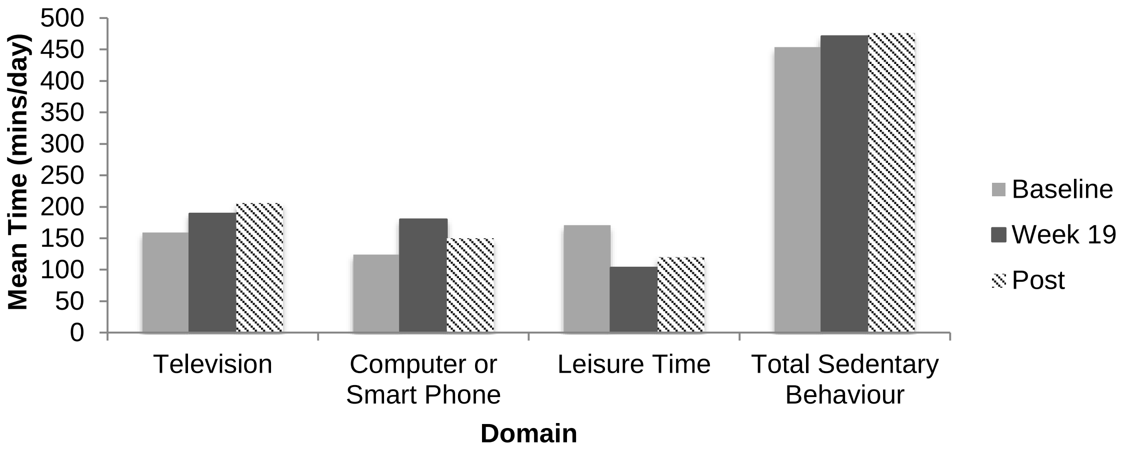


Figure 5-25: Mean self-reported sedentary behaviour domains (minutes/day) at baseline and weeks 19 and 31 (n = 7)

For *total* time spent in sedentary behaviour, three participants decreased their time on a weekday, with the greatest change being -210 minutes/day. Four participants decreased their time on a weekend day, with the greatest change being -90 minutes/day. For domain specific sedentary behaviour (individual change scores not shown), the majority of participants did not decrease their time spent sitting in the domains *watching television* and *using a computer/smart phone*. For *leisure time,* four participants decreased by ≥ 60 minutes/day on a weekday with the greatest change in time being -360 minutes/day, and three participants decreased by ≥ 60 minutes/day on a weekend day with the greatest change being -390 minutes/day.

5.3.4.3 Psychological wellbeing

A summary of the psychological wellbeing results between baseline and stage two post assessment is presented in Table 5-13.

Table 5-13

Change in psychological wellbeing indicators after 31 weeks

Outcome measure		**Baseline**	**Post stage one study**	**Statistics**		
		Mean (SD)	**Mean (SD)**	**Mean change (95% CI)**		**p value**
DASS 21	Depression	22.29 (9.76)	19.71 (13.73)	-2.6 (-11.99, 6.84)	t(6) = 0.668	0.529
	Anxiety	11.14 (8.40)	8.86 (5.40)	-2.3 (-10.16, 5.59)	t(6) = 0.710	0.504
	Stress	18.86 (5.15)	16.0 (6.11)	-2.9 (-8.59, 2.88)	t(6) = 1.219	0.269
WHOQOL-Bref	Physical	45.86 (17.74)	46.43 (14.89)	0.6 (-14.91, 16.06)	t(6) = -0.090	0.931
	Psychological	34.0 (20.17)	43.71 (20.61)	9.7 (-6.48, 25.91)	t(6) = -1.468	0.193
	Social Relationships	49.14 (23.54)	50.86 (15.41)	1.7 (-14.60, 18.03)	t(6) = -0.257	0.806
	Environmental	56.43 (15.45)	66.29 (17.44)	9.9 (-0.65, 20.37)	t(6) = -2.295	0.062

Depression, Anxiety and Stress (DASS 21)

Mean DASS 21 scores over time are presented in Figure 5-26. Three participants were excluded from the analysis, as they did not provide post stage two assessment data at week 31. There were non-significant decreases in depression, anxiety and stress scores.

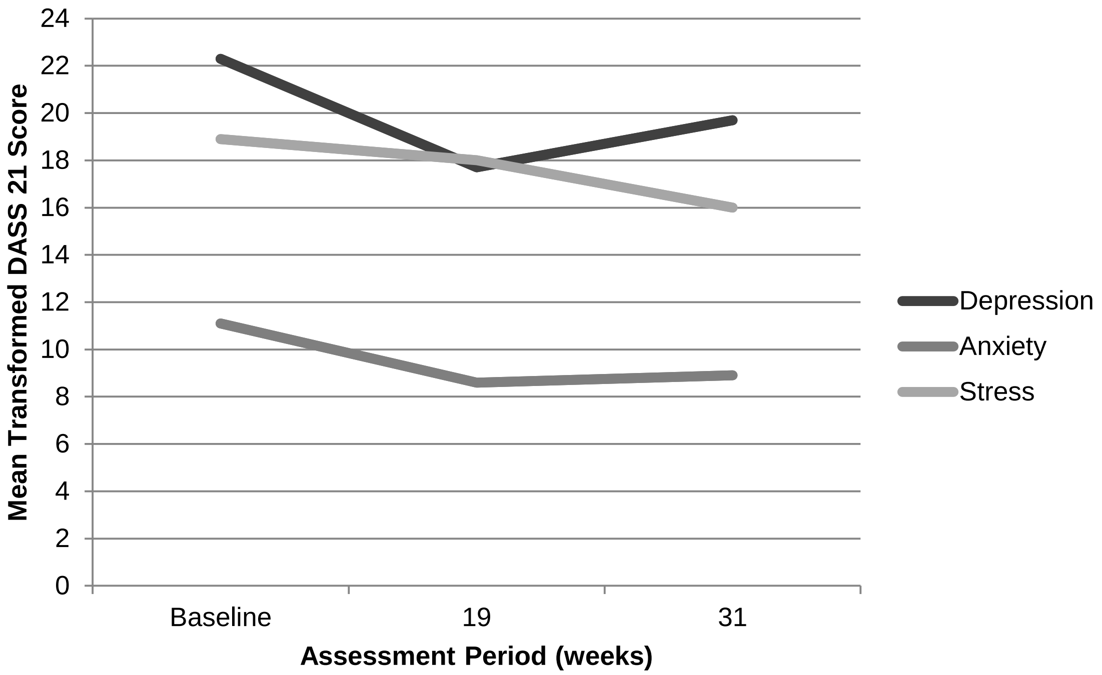


Figure 5-26: Mean DASS 21 scores between baseline and weeks 19 and 31 (N = 7)

Three participants had decreased depression scores between baseline and post stage two assessment, with two decreasing by ≥10. Four participants had decreased anxiety scores, with two decreasing by ≥-10. Five participants had a decrease in their stress scores between baseline and post assessment, with one participant having a decrease of -10.

World Health Organisation Quality of Life (WHOQOL) - Bref

Mean WHOQOL-Bref scores over time are presented in Figure 5-27. Three participants were excluded from the analysis, as they did not provide post stage two assessment data. There were non-significant changes for all WHOQOL-Bref domain scores.

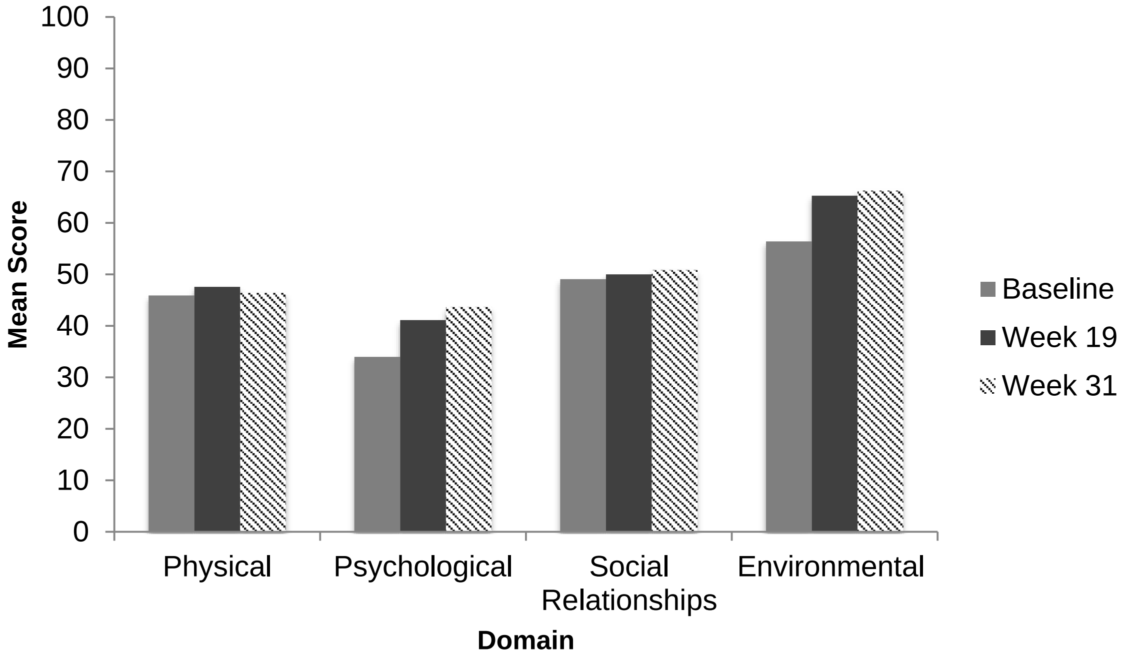


Figure 5-27: Mean WHOQOL-Bref scores between baseline and weeks 19 and 31 (N = 7)

More than half of participants' (57%) psychological health improved between baseline and post stage two assessment, with the highest changes in scores being +31 and +37. More than half of participants (57%) reported an improvement in their environment during the intervention.

5.3.5 Physical Activity Attitudes and Barriers

Physical activity attitudes and barriers were used to inform the individual counselling sessions. Over 90% of participants identified at baseline that their main reasons for engaging in physical activity were to maintain good health, improve emotional wellbeing, manage stress, improve appearance, control weight and improve energy levels. More than 90% of participants believed that physical activity was beneficial for managing heart disease, diabetes, arthritis, quality of life, resilience, psychological wellbeing, life balance and coping.

Participants' main barriers toward physical activity were poor physical and mental health and a lack of energy (>80%). Throughout the counselling intervention participants also described barriers towards physical activity of low motivation, hot weather and negative self-talk.

5.3.6 Participant Feedback

At the conclusion of stage one of the intervention (19 weeks), 14 of 16 participants provided feedback; 13 (93%) were either satisfied or very satisfied with the program and the medical review sessions; 13 (93%) were very satisfied with the sessions they spent with the nurse counselling sessions; and 13 (93%) participants were either satisfied or very satisfied with both the pedometer and written materials they received. One participant was dissatisfied with the program and individual program components.

Participants' main difficulties in attending the program were the travel distance, poor physical or mental health, competing life demands, limited choice of appointment times and fear of receiving negative results, i.e. having an increase in their weight since the last assessment. The majority of participants did not provide a comment when asked about the negative aspects of the clinic. Two participants identified difficulties with travel time, but acknowledged that this was more an individual concern.

Participants indicated positive aspects of the program included realistic goal setting, weight loss, friendly and patient practitioners, good follow-up, the information (from handouts) and knowledge gained (from practitioners) about physical health and the ongoing support, understanding and encouragement received throughout the intervention.

Suggestions for improving the program included having weekly versus three-weekly appointments and having more appointment times to choose from. One participant suggested a smart phone/tablet app, which would make it easier to record information and track progress.

In the open feedback section, participants voiced gratitude and satisfaction with the clinic. They found the staff knowledgeable and supportive, particularly in their approach, i.e. "*thank you for your holistic health care and your gentle words and manner*", "*I appreciate the knowledge and support which I am given"* and *"the assistance of the staff has been excellent*". Participants also expressed how their overall wellbeing had been improved by attending the clinic, i.e. *"The program has really helped me to realise how closely my mental health is linked to my physical health"* and *"This program has given me a new lease on life. Through attending the sessions, I have lost weight, found a better diet, managed my diabetes and learned the importance of physical activity and have been able to maintain it for a solid period."*

At the conclusion of stage two of the intervention, 7 of 10 participants provided feedback. Feedback results indicated that there was no clear consensus regarding participants' preferred frequency of counselling sessions or program duration.

5.4 Discussion

This study evaluated the effects of a nurse-led two stage metabolic health and physical activity counselling program to improve metabolic health indicators, physical activity levels and psychosocial wellbeing of outpatient adults with mental illness. There were statistically significant improvements between baseline and stage one (19 weeks) in waist circumference (mean change -2.7cm), waist to height ratio (mean change -0.02 points), and psychological (mean change +9.14 points) quality of life. There were statistically significant improvements between baseline and post stage two (31 weeks) for waist circumference (mean change -7.1cm), waist to height ratio (mean change -0.04 points), weight (mean change -5.6kg), and BMI (mean change -2.1 kg/m^2). Although trending in a positive direction, the changes observed in weight, BMI, physical activity, sedentary behaviour, and psychological wellbeing during stage one; and psychological wellbeing and quality of life during stage two, were not statistically significant. No significant changes were observed for blood pressure in both stages of the intervention.

Participants and engagement

Recruitment for this study was slow with 27 people recruited over a 7-month period, and was dependent on medical referrals to the program. The small number of referrals received may have been due to medical practitioners' limited knowledge of the benefits of the program or perceived patient unsuitability. This study sample had poor physical health, which is consistent with the extant literature on adults with mental illness [13-15,179]. All participants in this study were categorised as obese, and three quarters were diagnosed with metabolic syndrome at baseline. The prevalence of obesity and metabolic syndrome in this study sample (N=16) was ~50% higher than in other studies of adults with mental illness in Australia [30]. This may reflect the recruitment process, for example, only people who were considered to be of very poor physical health may have been referred to this program.

This study demonstrates that adults with mental illness across a range of diagnoses can engage in a behavioural counselling intervention with a strong emphasis on physical activity. Of those who commenced the program, 16 (89%) completed stage one (19 weeks), and 10 (100%) completed stage two (additional 12 weeks). These completion rates are similar to other lifestyle counselling interventions for adults with mental illness. For example, 74% of 1071 adults with severe mental illness completed a 3-month weight management lifestyle counselling intervention [145], 83% of 35 outpatient adults prescribed antipsychotics completed a 3-month behavioural counselling program for the treatment of obesity [192], and 85% of 200 outpatients taking antipsychotics completed a 12-month weight loss and lifestyle intervention [148]. Completion was substantially higher in the current study than the 29% reported for an 18-week nurse led lifestyle behaviour program for outpatient adults with mental illness [193]. This difference may reflect differences in program delivery and an increased demand for the other study: the other program consisted of twice weekly and group sessions, whereas the current study was every three weeks and had individual sessions.

Impact on primary metabolic health outcomes

The primary outcome measures for this study were waist circumference (WC) and waist-to-height ratio (WHtR). These measures have previously been shown as better predictors of adverse health outcomes (i.e. CVD and diabetes) than body mass index (BMI). A systematic review and meta-analysis of >300,000 participants from a diverse range of cultures indicated that WC ($p<0.05$) and WHtR ($p<0.001$) had significantly greater discriminatory power for predicting adverse health outcomes than BMI [180], and that WHtR was significantly better than WC for predicting diabetes, hypertension and cardiovascular disease ($p<0.005$) in both males and females [180]. A recent meta-analysis of cross-sectional studies also concluded that WHtR has stronger associations than BMI with Type 2 Diabetes Mellitus (T2DM) (rRR: 0.71, 95% CI: 0.59 to 0.84) and metabolic syndrome (rRR: 0.92, 95% CI: 0.89 to 0.96) [181].

The results from the current study indicate that the 19-week counselling program with face-to-face sessions every three weeks was effective in reducing WC and WHtR among outpatient adults with mental illness, with a reduction of 2.7cm ($p<0.035$) and 0.016 points ($p<0.037$) respectively. An 18-week nurse led behavioural lifestyle program also suggested improvements with a reduction in WC of 4.4cm in males and 0.7cm in females, however these results were not statistically significant [193]. In the current study, WC and WHtR continued to decrease in stage two of the program (additional 12 weeks, and a 50% reduction in the frequency of counselling sessions), with a significant reduction in WC of 7.1cm (p=0.024) and WHtR of 0.04 points (p=0.033) from baseline.

Impact on secondary metabolic health outcomes

Anecdotal reports from participants indicated steady increases in weight over the 6-12 months before commencing the counselling program (often attributed to the commencement of a new atypical antipsychotic). Consistent with this, there was an increase in mean weight between baseline assessment and the first intervention session (i.e. 2-3 weeks). Once the intervention commenced, a period of weight stabilisation occurred before weight decreased. At post stage one assessment (19 weeks) mean total weight loss was 1.8kg, although this change was not statistically significant (p=0.136). Among participants who engaged in both stages of the intervention over 31 weeks, there was a statistically significant mean weight loss of 5.6 kg (p=0.033) from baseline, with weight loss observed up to week 25, and stabilisation occurring between weeks 25 and 31, similar to what was observed for WHtR. This stabilisation may reflect typical trajectories of weight loss, or be explained by a concurrent decrease in participants' physical activity during stage two as discussed below.

Of those who completed the 31-week intervention (n=10), 60% lost ≥5% of their total body weight. This is an important finding, as research indicates that a weight loss of 5 to <10% over 12 months is associated with significant improvements in cardiovascular risk factors [194]. A recent meta-analysis of studies of lifestyle interventions for weight management in adults with psychosis reported an average loss of 3.12% of initial weight over 18 weeks [146]. A 12-month RCT where people prescribed antipsychotics attended diet and physical activity counselling weekly for the first 6 months, and then monthly for the next 6 months, demonstrated an average loss of 3.9% of their baseline weight [148]. It should be noted however that these other studies examined weight loss against a comparison group and the current study was a single group design.

The weight reduction of 5.6kg after 31 weeks in the current study is similar to an intensive nurse led 18-week lifestyle and behavioural change study of outpatient adults with mental illness that demonstrated a non-significant mean weight loss of

3.15kg from twice weekly sessions [193]; is higher than in a 12 week lifestyle intervention for people with schizophrenia, which showed a mean decrease in weight of 0.47kg (95% CI -1.23 to 0.3) [144] and 1.7kg (95 % CI -3.17 o 0.23) at 6-months follow-up [144]; and is greater than reported in a systematic review of single group lifestyle interventions for adults with serious mental illness that indicated a mean weight loss of 1.95kg over time an unspecified period of time [147]. Changes in BMI in the current study were -0.65 kg/m^2 at 19 weeks and -2.1 kg/m^2 at 31 weeks. This is higher than a meta-analysis examining lifestyle interventions for weight management in people with psychosis, which reported a mean decrease in BMI of 0.98kg/m2 over a mean intervention period of 18 weeks [146].

During both stages of the intervention, no statistically significant improvements in systolic or diastolic blood pressure were observed. Other research provides mixed results on the benefits of behavioural counselling for blood pressure. A physical activity counselling study of older adults in the general population indicated no change in blood pressure over 12 months [138]. However, a 12 month physical activity counselling program for people with T2DM indicated significant between group improvements in systolic blood pressure between baseline and 6 months, (mean difference: -6.3mmHg, 95% CI: -24.7 to -2.0) [141]. Study differences may reflect different target populations (older adults, those with diabetes versus mental illness) and different impact on physical activity levels, which has a positive association with blood pressure. Further research needs to be conducted regarding the effects of behavioural counselling on blood pressure.

Impact on physical activity and sedentary behaviour

Time spent in walking for transport, walking for recreation, and in moderate-intensity physical activity were all trending in a positive direction during the 19-week stage one of the intervention. These however, were not statistically significant, which may reflect the study's small sample size. It may also be that adults with mental illness need a long period of time to significantly improve and maintain physical activity levels. A Cochrane review found face-to-face counselling with community dwelling adults who were free from pre-existing medical conditions trended to increase self-reported physical activity over at least 12 months, however these increases were not statistically significant (OR: 1.52, 95% CI: 0.88 to 2.61) [134]. In the current study, nine participants (69%) increased total time in MVPA over stage one of the intervention (19 weeks), with six (46%) increasing their total time by >100 minutes/week. It should be noted that many participants were initially meeting the Australian Physical Activity Guidelines of at least 150 minutes per week [92], with a total median of self-reported moderate- to vigorous-intensity activity (MVPA) of 180 minutes/week (IQR: 55 – 460) (~26 minutes/day) at baseline. This remained unchanged at post stage one assessment (180 minutes/week, IQR: 97.5 – 705). It may be therefore, that ceiling effects reduced that impact of the counselling, and future research could consider recruiting participants with low activity levels to better determine the effectiveness of counselling on physical activity.

For the four participants whose physical activity decreased between the baseline and post stage one, two reported deteriorations in mental health, which negatively impacted their engagement in physical activity at the time of assessment. Prior to this, anecdotal evidence during the counselling sessions indicated good levels of activity engagement. The third participant reported being physically unwell and suffering from a broken toe during the activity assessment period (participant 4), and the fourth participant reported ongoing chronic back pain as a limitation to maintaining engagement in physical activity (participant 6). This again, indicates the limitations associated with a small sample size.

For participants who engaged in both stages of the intervention, self-reported physical activity decreased from 225 minutes/week (IQR: 150 – 495) to 90 minutes/week (IQR: 40 – 240) between baseline and stage two post assessment at week 31. The overall decrease in MVPA between baseline and week 31 may reflect the reduced frequency of counselling sessions in stage two, suggesting that adults with mental illness may need to receive sustained and frequent physical activity counselling to maintain behaviour change.

There was good concordance between participants' self-reported time spent in MVPA (mean ~26 minutes/day at baseline and week 19) and accelerometry MVPA results (mean 23 minutes/day at baseline and 25 minutes/day at week 19). Direct comparisons between self-report and objective MVPA, however, need to be treated with caution, as not all participants who completed self-report measures completed accelerometry, and the self-reported recall period and the accelerometer data collection period may not have been at the exact same time. Some inconsistencies were observed between the two data collection methods, with accelerometry data indicating that two participants increased their time in MVPA by >100 minutes/week, as opposed to six participants for self-reported data. It was also observed that between baseline and at post stage one assessment, participant one, who reported an increase of 40 minutes/week in self-reported MVPA, had an increase of 175 minutes/week for their objective measurement. This may have been a result of reporting errors or recall bias for self-reported MVPA at either baseline or post stage one assessment [80].

During the counselling sessions, participants were given brief advice to reduce time spent in sedentary behaviour. During stage one of the intervention, time spent in self-report sedentary behaviour was trending in a positive direction with a decrease in median times of 90 minutes/weekday and 120 minutes/weekend day from baseline to week 19. Accelerometry data were also trending in a positive direction, with a non-significant mean decrease of -17 minutes/day. This discrepancy between self-report and accelerometry results may be indicative of reporting errors. Difficulties in reporting sedentary behaviour among adults with mental illness were demonstrated by the earlier research in this thesis (Chapter 2) [195] and other research [82]. For participants who engaged in both stages of the intervention, time spent in weekday sedentary behaviour was also trending in a positive direction, with non-significant decreases in median time of 60 minutes/day. However, the median time spent sitting on weekend days increased by 60 minutes/day. This increase in weekend day sedentary behaviour may reflect participants' decreased time spent in physical activity, which was observed in Stage Two.

Impact on wellbeing

During both stages of the intervention, there were trends for reductions in self-reported depression, anxiety and stress, although these were not statistically significant. During the 19 week intervention, statistically significant improvements were reported for the domains of psychological health and environmental quality of life. Improvements in psychological health (assessed by questionnaire items relating to e.g. self-esteem, body image, positive thoughts and concentration) may be a reflection of participants' reduced weight, waist circumference and improved physical activity levels. It is unclear how the behavioural counselling may have impacted on participants' environment, as this was not a primary outcome of the counselling sessions. However program attendance and counselling may have positively impacted on responses to environmental quality of life questionnaire items regarding perceived accessibility to health care, opportunities for acquiring new information and skills, and participation in and opportunities for recreation and leisure. Significant changes to quality of life were not however, observed for participants who engaged in both stages of the intervention.

Qualitative observations

No distinctions were observed between the five participants with marked improvements in waist circumference, weight and physical activity (1, 4, 8, 9 and 10) and the other participants in terms of session attendance, diagnosis, education, employment or BMI at baseline. All five of these participants were female, and attended both stages of the intervention, which may reflect a high level of motivation. Two of these five participants were however unable to complete physical activity assessment at week 19 due to poor physical or mental health, but anecdotally reported prior improvements in physical activity levels. Three participants with poor outcomes in physical health measures (5, 7 and 15) were all of poor physical health at baseline (i.e. BMI >39), and although they had small improvements in total weekly MVPA, this may not have been sufficient to positively impact on physical health measures.

During both stages of the intervention, participants reported physical activity barriers of deteriorating/fluctuating mental health, decreased motivation, increased fatigue, and physical health concerns. It is therefore recommended that these are key foci when providing activity counselling to adults with mental illness. Clinicians need to have realistic expectations in regards to goal setting, be supportive when participants have setbacks, problem solve barriers, and create opportunities for continuing counselling around periods of hospitalisation.

5.5 Methodological considerations

A limitation of this study is the small sample size and therefore potential lack of power to assess change in some of the secondary outcome measures. Caution should be used in generalising the results to all adults with mental illness due to the sampling limitations. The study sample was not random, and not all who consented completed assessment. There was no control or comparison group to assess efficacy of the counselling sessions versus naturally occurring changes over time. The majority of participants in this study had depression as their primary diagnosis. Different results may have been obtained if there was a different mix of diagnoses. There was no way to ascertain if participants' reports of engagement in physical activity were at a sufficient intensity to constitute MVPA, and when combined with potential reporting errors, self-reported MVPA may have been over-estimated. The suggested effect of the intervention on self-reported physical activity levels needs to therefore be treated with caution. Due to the limitations imposed on the program by the outpatient facility, the content of participants' sessions with the medical practitioner were unable to be monitored. Dietary change was not monitored, and may have implications for the weight-related results of this study. As there was no control for psychiatric treatment received throughout the intervention, any causal relationships between the intervention and participants' psychological health were therefore unable to be established.

5.6 Conclusions

This study suggests that adults with mental illness can engage in a nurse-led metabolic health and physical activity counselling intervention. Results demonstrate that at least 19 weeks of behavioural counselling can be effective for improving the poor physical health of adults with mental illness by promoting significant reductions in waist circumference, waist to height ration and quality of life. A behavioural counselling program of at least 31 weeks demonstrates further significant reductions in weight and body mass index. Longer periods may be needed for changes in physical activity. It is recommended that behavioural counselling programs involve face-to-face sessions at a frequency of every three weeks, be sustained over time, and have an ‘open door’ policy to allow for attendance interruptions, i.e. hospitalisation.

CHAPTER 6: Discussion

6.1 Overview of research

The overarching aim of this research was to understand and promote physical activity in adults with mental illness, to improve physical health. In Australia, mental illness affects one in five people in any 12-month period [1], and the financial cost to the national health care system is surging, with current estimates at $7.2 billion per year [7]. Adults with mental illness have a significantly lower life expectancy than the general population and this is largely due to poor physical health [13-15,179]. Physical activity may be a key factor in improving poor physical health among adults with mental illness, as it is has been consistently recognised for the prevention and management of many metabolic risk factors and non-communicable diseases, and is also known to have benefits for psychological wellbeing [34,35,37,38,58,68]. There is therefore a call for physical activity to be an integral component in the prevention and management of many of the mental and physical health problems that are prevalent in people with mental illness [55,120]. Physical activity interventions among this population should be as broad as possible as physical activity is not a “one-size fits all” [120].

To inform the development and evaluation of physical activity interventions for adults with mental illness, the objectives of this thesis were to:

- Assess the feasibility and acceptability of physical activity and sedentary behaviour data collection methods among inpatient adults with mental illness
- Assess the physical activity and sedentary behaviour of inpatient adults with mental illness
- Assess the physical activity attitudes to, and preferences for contexts and sources of support among inpatient adults with mental illness
- Evaluate the effects of a metabolic health and physical activity counselling program to improve the metabolic health indicators, physical activity and psychosocial wellbeing of outpatient adults with mental illness.

This thesis consisted of two studies which aimed to address identified gaps in the literature. The first study was a cross-sectional survey of inpatient adults with mental illness at a private psychiatric hospital. In total, 101 participants completed self-reported questionnaires and 38 wore an accelerometer for 7 consecutive days. The second study was a nurse-led single group two stage intervention trial of outpatient adults with mental illness. Sixteen participants completed stage one (19 weeks) and 10 participants completed stage two (a further 12 weeks) of a metabolic health and physical activity counselling program. A summary of the key findings from these two studies follows.

6.2 Key findings

Objective 1: To assess the feasibility and acceptability of physical activity and sedentary behaviour data collection methods among inpatient adults with mental illness.

Measurement of physical activity and sedentary behaviour is an integral part of surveillance research and program evaluations. Other studies have primarily focused on the reliability and validity of the measures [85-88], which are important attributes. This PhD research program examined measurement from a person-centered perspective among inpatient adults with mental illness, i.e. feasibility and acceptability. This study demonstrated that inpatient adults with mental illness can engage with both self-report and objective physical activity and sedentary behaviour measurement. Accelerometers may be less acceptable than questionnaires, however they are easier for inpatients to use than questionnaires or diaries, and sedentary behaviour questionnaires are more difficult to complete than activity questionnaires.

A high proportion of those who commenced the assessment completed both the questionnaires (86%) and accelerometry (76%) components of the study, and a very high proportion of those doing accelerometry (95%) adhered to the accelerometry wear time protocol. Participants with high distress did not find questionnaires or accelerometry more difficult than participants with low-moderate distress. The proportion of participants completing accelerometry and meeting wear-time criteria is consistent with previous research of adults with mental illness living in the community, in which 70% completed accelerometry and 88% met wear-time criteria [89], and considerably higher than in some general population studies, with one reporting 60% [163], and another reporting 79% [162] meeting accelerometer wear-time criteria.

Accelerometers may, however, not be highly acceptable among adults with mental illness. Of the 118 who agreed to participate in the first study, only 50 (42%) agreed to do the accelerometry. Of the 16 participants who wore the accelerometer and met wear time criteria at baseline of the intervention study, only 11 (69%) did so at the end of stage one. In both studies, participants indicated that the burden of wearing the monitor each day was too high or that they forgot to wear the monitor.

Among those who did both the questionnaires and accelerometry, findings indicated that inpatient adults with mental illness found it less difficult to wear an accelerometer during waking hours than to complete physical activity ($p=0.005$) and sitting time ($p<0.001$) questionnaires; or to complete the activity diary ($p=0.002$). These findings are consistent with a study of adults with mental illness living in the community that indicated accelerometers were more feasible than questionnaires ($p<0.001$) [89]. Questionnaires and diaries may be more difficult because they rely on recall and are therefore more prone to reporting errors or recall bias [80].

Participants found it more difficult to report sitting time over the last week than physical activity over the same time period ($p<0.001$). Other studies have also found that reporting physical activity is easier than reporting sitting time ($p<0.001$) [89]. The difficultly in reporting sedentary behaviour may be due to the high levels in this population [82,199], and that sedentary behaviour is less discrete than physical activity, and therefore harder to recall.

Objective 2: To assess the physical activity and sedentary behaviour of inpatient adults with mental illness.

Little research has purposively assessed the physical activity and sedentary behaviour levels of inpatient adults with mental illness. This study demonstrated that participants could engage with physical activity while in hospital, with 65% meeting the Australian Physical Activity Guidelines of at least 150 minutes/week [92]. Self-report data indicated a median self-reported MVPA of 32 minutes/day (IQR: 14.46-85.71). This was consistent with accelerometry results, which indicated an average of 37 minutes/day in MVPA.

These results are similar to a study of people with psychosis living in the community that indicated an average of 48.5 minutes/day in MVPA [94], but contrast other research indicating that the majority of outpatient adults with mental illness are not meeting activity guidelines [96,97,104]. The higher levels of activity in this inpatient population may be because that while in hospital, people experience changes in competing time demands, for example work attendance, that enables them to engage with activity. As participants were "voluntary admissions", they were able to take frequent leave from the hospital to walk to and around a nearby shopping mall, which would have contributed to MVPA levels. Inpatients may also have greater support for physical activity than outpatients e.g. free hospital based programs and access to exercise instructors.

This study demonstrated that inpatients engaged in high levels of sedentary behaviour. Self-report data indicated a median of 761 minutes/day (12.7 hours) (IQR: 552.43–917.14) in sedentary behaviour, and accelerometry data indicated an average of 664 minutes/day (11.1 hours). Previous studies using objective measurement have produced mixed results; one study found that outpatient adults with bipolar disorder spent an average of 13.5 hours/day in sedentary behaviour [96], while another found that outpatient adults with schizophrenia spent an average of 6.75 hours/day sedentary [103]. Different results among studies may reflect the different diagnoses among study samples.

Findings from this research program demonstrated that inpatients spent more time in sedentary behaviour on weekdays than weekend days. Self-report data (13 hours/weekday and 10 hours/weekend day) were consistent with accelerometry results (11 hours/weekday and 10 hours/weekend day). This may have been due to time spent sitting in meetings with allied health professionals (67.5 minutes/weekday), who are more likely to work on weekdays than weekends. Time spent sitting doing nothing during the day (2 hours/day) was also identified as a major contributor to overall time spent sedentary. Notably, participants' limited self-reported time spent watching television (1 hour/day) contrasts with general population studies. For example, one population study indicated an average time of 13 hours/week, almost double the time in this current study [93]. This may reflect participants' limited access to television while in hospital because of a pay for use policy.

Objective 3: To assess the physical activity attitudes and preferences for contexts and sources of support among inpatient adults with mental illness.

Physical activity programs that are perceived as beneficial and consistent with individuals' preferences may be more appealing and thereby promote engagement. The inpatient experience may influence preferences for how and where to do physical activity and sources of support. Results from this research demonstrated a high proportion of inpatient participants (77%) were interested to do physical activity while in hospital. The main reasons (≥ 95% agreement) were to control weight, maintain good health, manage stress, and improve emotional wellbeing. This is consistent with other research which indicates that adults with mental illness perceive physical activity as important for improving physical and mental health [112-114]. Over 90% of inpatient participants agreed that physical activity has benefits for managing psychological wellbeing, chronic disease and quality of life. However, fewer than half were unsure if physical activity had benefits for managing serious mental illnesses, i.e. schizophrenia.

The least endorsed reason for doing physical activity among inpatients was the social aspect, i.e. meeting people (27%). This may be because of high levels of social anxiety/discomfort or self-consciousness, which are often experienced among adults with mental illness. Other research however has indicated that one of the primary benefits of participating in physical activity among adults with mental illness is an opportunity for social interaction and support [177]. This discrepancy suggests that, although the social benefits of physical activity can be appreciated when experienced, they may be insufficient motivation for adopting activity.

The most commonly preferred physical activity type among inpatients was walking, which is consistent with studies in both general [106,107] and mental health populations [113,114]. This may be because walking is low demand and can be self paced, therefore making it an attractive option, particularly for inpatients who often have physical co-morbidities such as chronic pain. Two thirds of participants preferred activity that can be done at a fixed time and with a set routine and format, which may reflect a need for structure. They also had a preference for activities that can be done alone; inpatients may be reluctant to do physical activity with others because of social anxiety, negative body image or differing levels of fitness. Females were more likely than males to prefer physical activity that can be done with others of the same gender ($p=0.001$) and with others at the same level of ability ($p<0.001$). This contradicts previous research with psychologically distressed individuals in the general population that found no gender differences in context preferences [115]. This could be attributed to the difference in samples between the two studies: female inpatients may have a high level of self-consciousness and more concern with social competitiveness when doing physical activity with men than outpatients.

Approximately a quarter of inpatients preferred a personal trainer, physiotherapist or an exercise physiologist to recommend, design or lead physical activity programs; a general nurse or doctor were the least preferred. This may be because participants want exercise specific specialist knowledge and instruction, and to lessen the medical focus which is very prevalent in their mental health care. These results however, contradict previous research in both the general and mental health population which indicates a high preference for doing physical activity recommended by the doctor [107,113,114]. It now may be that there is greater awareness of the different types of exercise specialists than in earlier research, or that previous research did not offer a range of exercise specialists as preference options.

Fatigue and lack of motivation were primary barriers to doing physical activity while an inpatient. These findings are consistent with other research among adults with mental illness [112-114] and also a study of physical therapists perceptions of barriers to physical activity among persons with schizophrenia [178]. Fatigue and motivational difficulties are common symptoms of many mental illnesses.

Objective 4: To evaluate the effects of a metabolic health and physical activity counselling program to improve the metabolic health indicators, physical activity and psychosocial wellbeing of outpatient adults with mental illness.

Evidence suggests that behavioural counselling is an effective method for promoting physical activity among the general population and for non-communicable diseases [124,135,136]. Little research however, has examined the effectiveness of physical activity counselling among adults with mental illness. The findings from this PhD research demonstrate that outpatient adults with mental illness can engage in a behavioural counselling intervention that has a strong emphasis on physical activity. Of those who commenced the program, 16 (89%) participants completed stage one (19 weeks), and 10 (100%) completed stage two (additional 12 weeks) of the intervention. These completion rates are similar to other lifestyle counselling interventions (not focusing on activity) ranging between 3-12 months duration for adults with mental illness [145,148,192].

The results demonstrated that this 19-week metabolic health and physical activity counselling program with face-to-face sessions every three weeks was effective in significantly reducing WC and WHtR among outpatient adults with mental illness, with a change from baseline of 2.7cm ($p<0.035$) and 0.016 points ($p<0.037$) respectively. Another 18-week nurse led behavioural lifestyle program also suggested improvements with a reduction in WC of 4.4cm in males and 0.7cm in females, however these results were not statistically significant [193]. This previous study differed from this current research in that it consisted of twice weekly group sessions. The findings of this study suggest that low frequency individual tailored counselling sessions have a similar potential for improving metabolic health outcomes to those seen with more frequent group based counselling sessions.

For the 31-week program (which had a 50% reduction in the frequency of counselling sessions after week 19), WC and WHtR continued to decrease, with a significant reduction in WC of 7.1cm ($p=0.024$) and WHtR of 0.04 points ($p=0.033$) from baseline (n=10). There were also statistically significant reductions in weight of 5.5 kg ($p=0.033$) and BMI of 2.07 kg/m^2 ($p=0.022$) after 31 weeks, but not after 19 weeks. This suggests that a longer counselling period may be more effective for promoting changes in metabolic health. However, it was noted that fewer people (63%) in this study agreed to the longer counselling period. The majority of the participants who did not engage with stage two did not voice dissatisfaction with the extended behavioural counselling program, but were unable to participate due to deteriorating mental health, changes in employment status and pending weight loss surgery. This highlights the importance of such programs allowing for people to “come and go”.

Of those who completed the 31-week intervention (n=10), 60% lost ≥5% of their total body weight. This is an important finding, as research indicates that a weight loss of 5 to <10% over 12 months is associated with significant improvements in cardiovascular risk factors [194]. A recent meta-analysis of studies of lifestyle interventions for weight management in adults with psychosis reported an average loss of 3.12% of initial weight over 18 weeks [146]. A 12-month RCT where patients prescribed antipsychotics attended diet and physical activity counselling weekly for the first 6 months, and then monthly for the next 6 months, demonstrated an average loss of 3.9% of their baseline weight [148]. It should be noted however that these other studies examined weight loss against a comparison group and the current study was a single group design.

The effectiveness of the program on physical activity was unclear. Time spent in walking for transport, walking for recreation, and in moderate-intensity physical activity trended in a positive direction after stage one (19-weeks) of the intervention, although this was not statistically significant. Two participants, who anecdotally reported improvements in physical activity throughout stage one, were unable to complete physical activity assessment at week 19 due to poor physical or mental health. Due to the small sample size, these two omissions may have affected significance testing. No improvements in physical activity were observed after stage two of the intervention (31 weeks) and this may reflect insufficient frequency of counselling sessions, which were reduced from every 3 weeks to every 6 weeks. This lack of significant improvement in activity was disappointing given the physical activity focus of the counselling. Many participants were however, already meeting physical activity guidelines with a median of self-reported total MVPA of 180 minutes/week (IQR: 55 – 460) (~26 minutes/day) at baseline, which remained unchanged at post stage one assessment (180 minutes/week, IQR: 97.5 – 705). These data were similar to accelerometry results (23 minutes/day and 25 minutes/day in MVPA, respectively).

The effectiveness of the program on wellbeing was mixed. A statistically significant improvement was demonstrated for self-reported psychological quality of life (9.14, p=0.048) during stage one of the counselling program. Environmental quality of life (4.93, p=0.050) was bordering significance during stage one, however no other significant changes were observed for participants who engaged in both stages. Improvements in psychological health (questionnaire items assessed self-esteem, body image, positive thoughts and concentration) may have been a reflection of participants' reduced weight, waist circumference and improved physical activity levels. It is unclear how the behavioural counselling may have impacted on participants' environment, as this was not a primary focus of the counselling sessions. However, program attendance and counselling may have positively impacted responses to environmental quality of life questionnaire items, which assessed perceived accessibility to health care, opportunities for acquiring new information and skills, and participation in and opportunities for recreation and leisure. Participants had non-significant reductions in their depression, anxiety and stress scores, although these were trending in a positive direction. This may be a reflection of the fact that the counselling sessions did not specifically target psychological wellbeing. It may also be that the non-significant improvements in physical activity were insufficient to promote psychological change.

6.3 Methodological considerations

The following section summarises the methodological considerations from this PhD research program.

Study samples

Study samples were not randomly selected. The majority of participants in both studies had depression as a primary diagnosis. The severity of patients' mental illness was not established. Caution therefore is needed when generalising the results to all adults with mental illness. Different results for both studies may have been obtained with a different mix of diagnoses, for example if there were more participants with a diagnosis of schizophrenia or bipolar affective disorder.

Study one used a convenience sample and may therefore have been biased. The context was a private psychiatric hospital, which may have a different profile of patients than in a public setting. Not all eligible participants were invited to participate. Patients who were unable to be located due to leave from the hospital during recruitment were not followed up and therefore not included in the study. The study focus may have also given rise to the possibility of bias. Patients who had no interest in physical activity or those that had poor mental health, may not have consented to participate. Patients who were involuntary or experiencing acute psychosis were excluded from the study, therefore the feasibility of completing study components among this sub-population was unable to be determined Also, to minimise participant burden and to respect privacy, data regarding severity of diagnosis and length of inpatient stay were not included and therefore were unable to be reported. However, the sample size of study one was larger than previous studies in this area [112,174].

Study two was also a convenience sample, with participants referred to the counselling program by a medical practitioner. This may have also given rise to the possibility of bias as medical practitioners may have only referred persons who were of poor physical health, or who they perceived were a good match for the program, i.e. obese. The sample size for this study was also small which reduced power to detect changes across all variables. A single participant's negative result may attenuate overall results. There was also no control or comparison group to assess the effects of the counselling sessions with standard care.

Measurement

This research had good quality physical activity and sedentary behaviour measures. The self-report measures had acceptable psychometric properties [170,156]. The studies also used objective measures of physical activity and sedentary behaviour (Actigraph GT3x accelerometers) which are prone to less bias than questionnaires, as they do not rely on participant recall or reporting. If however, different methods of objective measurement (e.g. wrist versus waist worn accelerometers) or questionnaires (e.g. different recall periods or non domain specific) had been used in the feasibility of measurement study, results may have differed. It is important therefore, not to generalise these results to all methods of physical activity and sitting time measurement. It should also be noted that self-report and objective measurement of physical activity and sedentary behaviour were not conducted at the exact same time, therefore direct comparisons were not able to be made between the two methods of assessment. Also, there were no means of ascertaining whether participants' self-reports of walking or physical activity were at a sufficient intensity to constitute MVPA.

The intervention study did not control for some factors that had the potential to impact on the outcome measures. There was no control for psychiatric treatment received throughout the intervention, which could have impacted on wellbeing results; and there was no control for diet changes, which could have influenced weight change results. There was also no means by which to monitor advice given during the medical review sessions. This was a single group trial; any causal relationships between the counselling program and changes in the outcome measures were therefore unable to be established.

6.4 Practical implications

The practical implications of this research program primarily relate to the development of inpatient programs for reducing sedentary behaviour and programs for improving physical activity among adults with mental illness.

It is recommended that there is a need for interventions to address the high levels of sedentary behaviour among inpatient adults with mental illness [120].The results from this research demonstrate that inpatient adults with mental illness spend a significant amount of time engaged in sedentary behaviour, in particular in time spent doing nothing and weekday talks with allied health professionals. Psychiatric hospitals could consider employing full-time diversional therapists (covering both weekdays and weekend days) to engage patients in regular non-sedentary activities, i.e. cooking, gardening projects, games, outings. Allied health professionals could also consider walking appointments with inpatients to reduce sitting time. As seen in this study, restricted access to television can also contribute to reduced sitting time.

It is recommended that psychiatric hospitals offer inpatient physical activity programs. Time spent in hospital offers a good opportunity to establish positive self-management practices that can then be continued out of hospital. This PhD research demonstrates that adults with mental illness have an interest in and capacity for physical activity in hospital. Hospitals may consider employing full-time exercise specialists to offer patients a range of physical activities throughout the day to meet individual needs [120]. It is recommended that these physical activity programs have a strong focus on walking, be offered at set times during the day, and have options for patients to engage in activity on their own. It is recommended that these physical activity programs promote benefits of weight control, improved physical health and stress management. There is also a need to specifically indicate the benefits for serious mental illness. Programs should also include female only activities and be stratified by level of ability, to encourage participation. Physical activity programs do not have to be tailored for level of distress. If appropriate, enabling patients to have leave to access local destinations (e.g. shops) can contribute to activity participation.

It is also recommended that inpatient physical activity programs incorporate specific strategies to redress barriers of fatigue and low motivation. For example, programs could be low impact and of short duration for those with fatigue. Programs could integrate a motivational interviewing or physical activity counselling component to promote motivation. Strategies previously demonstrated as promoting activity motivation among the general population include goal setting focusing on realistic expectations, action planning, self regulation strategies, and the use of personal activity trackers, i.e. pedometers for self-monitoring [124,135].

It is recommended that physical activity counselling be incorporated into the management/treatment of outpatient adults with mental illness to improve indicators of poor physical health, in particular waist circumference and weight. It is recommended that activity counselling programs involve face-to-face sessions at a frequency of at least every three weeks, be ongoing, and have an 'open door' policy to allow for attendance interruptions that may be caused by deteriorations in mental state or physical health. Previous research indicates that it may take at least 12 months to see significant improvements in physical activity among this population [134].

Mental health nurses are well placed to deliver physical activity counselling as they spend a lot of time in close patient contact [196]. They may also experience fewer barriers to counselling than other health practitioners, e.g. less time constraints than general practitioners [126,127,197]. However, lack of knowledge and educational preparation regarding activity counselling may limit their ability to perform this role effectively [198]. Therefore, nurse education programs could be directed towards improving the knowledge of mental health nurses regarding the poor physical health of adults with mental illness, the benefits of physical activity for this population, and how to do physical activity counselling. This knowledge could also be incorporated into the nursing undergraduate curriculum.

6.5 Recommendations for future research

Recommendations for future research primarily relate to measurement and study participants.

It is recommended that accelerometers are used in future research on physical activity and sedentary behaviour with adults with mental illness. This is more important for assessing sedentary behaviour than physical activity. Accelerometers are less vulnerable to bias than questionnaires, and this research indicates they are feasible for use among adults with mental illness. This is important as there can be misconceptions regarding the capacity of adults with mental illness to engage with objective measurement of physical activity and sedentary behaviour.

However, this research also demonstrated that accelerometers may be less acceptable than questionnaires among people with mental illness. There is a need, therefore, for clinicians and researchers to highlight the ease of wearing accelerometers over completing questionnaires, and to identify and problem solve concerns regarding accelerometry during recruitment and assessment.

If using self-report measures, physical activity questionnaires are acceptable, however the results from sedentary behaviour questionnaires should be treated with caution. Participants also found activity diaries that involve self-reporting accelerometer on/off times, and engagement in physical activity and sedentary behaviour difficult to complete. It is therefore recommended, that if activity diaries are required, simplified versions be used for this population. For example, a single page log that only records context and type of behaviour may be more feasible than a detailed diary describing accelerometer on and off times. Research indicates that there is not a need for activity diary information regarding accelerometer on and off times as automated software filters are just as accurate for wear time processing [200].

Given the earlier recommendation for interventions to reduce sedentary behaviour among inpatients, research is needed to identify acceptable, feasible and efficacious strategies. Such strategies could include walking appointments with allied health professionals and engaging diversional therapists to increase hospital based activities. In particular, there is a need to identify and evaluate strategies to redress time spent sitting doing nothing.

Throughout this research, self-report and objective measurement of physical activity were not conducted at the same time, therefore direct comparisons between the two methods of measurement were unable to be made. Future studies are needed to assess the validity of self-report measurement of physical activity and sedentary behaviour among inpatient adults with mental illness. This can provide more information on the potential utility of questionnaires, which in turn would enable researchers to make decisions regarding methods of physical activity or sedentary behaviour measurement.

More work is needed to identify those adults with mental illness who are not physically active. Study one found that 35% of patients were not meeting the Australian Physical Activity Guidelines of at least 150 minutes/week. Future research could also monitor physical activity across the transition from inpatient to outpatient to identify the characteristics of those who become inactive. Both of these patient groups can then be targeted for assistance.

This research demonstrated that preferences for how and where to do physical activity and sources of support did not differ by levels of distress. However, the convenience study sample and assessment methods limited evaluation of differences in preferences by other factors. Future research could explore physical activity context preferences and attitudes e.g. by diagnosis. This information can be used to further customize physical activity interventions, i.e. those diagnosed with schizophrenia may have different activity preferences and attitudes than those with depression.

This research demonstrated that a metabolic health and physical activity counselling intervention is effective for achieving statistically significant reductions in waist circumference and weight. To enhance the strength of this evidence, it is recommended that future intervention trials are designed with a comparison group (i.e. RCTs) to examine efficacy. It is also recommended that such research should incorporate random sampling and participants with a range of mental health diagnoses to improve generalisability. To reduce potential ceiling effects that may have reduced the impact of the counselling, it is recommended that future research recruit participants with low baseline activity levels. Future interventions may also consider assessing the impact of physical activity counselling on blood pressure, and control for confounds, e.g. diet and psychiatric treatment, as there is a paucity of evidence in this area.

It was noted that prior to the commencement of this counselling intervention, the majority of participants anecdotally reported that they had had notable increases in their weight over the previous 6-12 months, and this commonly occurred after the commencement of a new atypical antipsychotic medication. Research indicates that atypical antipsychotics are among the most obesogenic drugs [201-204], with one study indicating an average weight gain of 24.6kg since commencement of treatment with an atypical antipsychotic, with a mean increase of 5.8kg/year [205]. The combination of atypical antipsychotics with negative symptoms of mental illness (i.e. avolition, lethargy and adhenonia), may therefore considerably contribute to weight gain among adults with mental illness. In this study, 10 (63%) participants were prescribed at least one atypical antipsychotic with Quetiapine being the most commonly prescribed. However, only three participants had a diagnosis of psychotic disorder, which suggests that Quetiapine may have been prescribed for its alternative properties, i.e. as a mood stabiliser or sedative. Therefore future studies that aim to improve the poor physical health of adults with mental illness, could consider recruiting participants based on medication profiles as opposed to diagnosis alone.

To evaluate physical activity programs among adults with mental illness, researchers need to consider strategies to promote engagement with repeated objective assessment of activity. This research showed good engagement in the cross-sectional study and the baseline assessment of the intervention, but declining engagement with the repeated assessment in the intervention study. Offering gratuities with increasing value over time and providing regular verbal or written prompts to wear the accelerometer, may improve engagement over time.

6.6 Significance and innovation

Both studies contribute to improved understanding of physical activity behaviour, measurement and interventions among adults with mental illness. This is an important area of research because of the high prevalence of mental illness and burden of comorbid poor physical health. The implementation of physical activity programs for adults with mental illness could improve poor physical health, reduce gaps in life expectancy and reduce healthcare use and costs.

The studies described here were innovative. Study one involved inpatient adults with mental illness, and this population is generally under-studied. This was the first known study to:

- Assess *both* physical activity and sedentary behaviour using *both* objective and self-report methods of measurement (versus one type of behaviour or measure only) in inpatient adults with mental illness
- Examine *in detail* preferences for physical activity context and sources of support among inpatient adults with mental illness, and differences by distress and gender

This information can be used to inform the development of physical activity and sedentary behaviour programs for inpatient adults with mental illness.

Study one also explored measurement properties of acceptability and feasibility versus psychometrics. This is important because it can inform researchers' selection of measures, and provides evidence to challenge potential misperceptions about this cohort.

Study two was innovative in that it adapted a counselling method that has previously been used successfully in the general population, and with people with non-communicable conditions, for outpatient adults with mental illness. This research demonstrated that a behavioural counselling intervention was feasible and can be beneficial for improving the poor physical health of adults with mental illness.

6.7 Conclusions

This research demonstrates that inpatient adults with mental illness are interested in activity programs and can engage with physical activity. Inpatients can engage with objective measurement of activity and sedentary behaviour, as well as activity questionnaires, but may be reluctant to wear activity monitors and find self-report of sedentary behaviour difficult. It is recommended that inpatient activity programs highlight the specific benefits for serious mental illness, focus on walking, be led by staff with exercise expertise, and include specific strategies to allow for fatigue and support motivation. There is a need for inpatient interventions to reduce sedentary behaviour and these could focus on time spent doing nothing and with allied health professionals.

Physical activity counselling can be an effective strategy for improving the poor physical health of adults with mental illness, and can promote significant reductions in waist circumference, weight and improve quality of life. Programs could be nurse led and it is recommended that they involve face-to-face sessions at least every three weeks, be sustained for a minimum of 12-months, and have an 'open door' policy to allow for attendance interruptions that may be caused by episodic deteriorations in mental state or physical health.

The significantly reduced life expectancy of adults with mental illness is a major concern and more work is needed to improve the poor physical health of this population. Physical activity is consistently recognised as having benefits for the prevention and management of most metabolic-risk factors and non-communicable diseases and can improve psychological wellbeing across the lifespan. Improving understanding of physical activity among adults with mental illness and developing new strategies to promote engagement among this population, may therefore contribute to a significant improvement in poor health outcomes, which can have significant impact on individual patients, associated health care costs and population health and wellbeing.

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APPENDIX A: Abstracts and conference presentations

A.1 Conference abstract: Physical activity motivators in adults with mental illness.

Fraser, S., Brown, W., Whiteford, H., and Burton, N. (2014). Physical activity motivators in adults with mental illness. The University of Queensland, School of Human Movement and Nutrition Sciences Postgraduate Conference. Stradbroke Island, QLD, Australia, 22nd – 24th April 2014.

A.1.1 Abstract

Physical activity may be an effective strategy for managing the poor physical health of adults with mental illness, and has benefits for improving psychological wellbeing. The aim of this study was to determine the primary motivators of adults with mental illness to do physical activity in in-patient psychiatric settings. A total of 101 in-patient adults (23 males, 73 females) aged 18-75 years (mean age 40.7 years; SD 14.5) with a mental illness were recruited from a private psychiatric hospital in Brisbane. Participants completed a self-administered questionnaire and indicated the importance of each of 16 motivators for physical activity using a 5-point Likert scale. Participants rated their interest to do physical activity as an in-patient using a scale of 1 to 10, with 10 indicating a high interest. Descriptive statistics were used to analyse results. Participants expressed a high level of interest (mean 7.70, SD 2.3) to do physical activity as an inpatient, and the primary motivators for doing physical activity as an inpatient were to control weight (98%); maintain good health (98%); manage stress (95%), and improve emotional wellbeing (94%). The least endorsed motivator was the social aspect of exercising (27%). In-patient adults with mental illness are motivated to engage in physical activity. These results indicate that inpatient physical activity programs should focus on managing weight, physical health, stress and mental wellbeing, with less emphasis on the social aspects.

A1.1.2 Title slide

THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

Physical activity motivators in adults with mental illness

Sarah Fraser, Professor Wendy Brown,
Professor Harvey Whiteford, Dr Nicola Burton

CRExPAH
Centre for Research on Exercise, Physical Activity & Health

A.2 Conference abstract: Physical activity and sedentary behaviour in adults with mental illness at a private psychiatric hospital.

Fraser, S., Brown, W., Whiteford, H., and Burton, N. (2014). Physical activity and sedentary behaviour in adults with mental illness at a private psychiatric hospital. (Abstract). *Journal of Science and Medicine in Sport, 18*, e149. The National Physical Activity Conference, Canberra, ACT, Australia, 15th – 18th October, 2014.

A.2.1 Abstract

Introduction: Physical inactivity and sedentary behavior have been positively associated with poor physical health and may therefore contribute to the reduced life expectancy of adults with mental illness. Hospital admissions provide health professionals opportunities to assess and promote healthy behavior habits for adults with mental illness. The aim of this study was to assess the physical activity and sedentary behaviour of adults with mental illness in an in-patient psychiatric setting.
Methods: 101 in-patient adults (72% female) aged 18-75 years (mean 40.7 years; SD 14.5) were recruited from a private psychiatric hospital in Brisbane, Australia. Participants completed a written questionnaire to assess time spent in the previous week walking to get to and from places, walking for recreation, and in moderate- and vigorous-intensity activity. Participants also indicated sitting time on a usual weekday and weekend day for 1) travel, 2) watching television, 3) using a computer, 4) psychological wellbeing interventions, 5) smoking, 6) general relaxing, 7) doing work (not on a computer), and 8) doing nothing. Total physical activity was calculated by adding time (minutes) spent in each domain, with weighting for vigorous activity. Descriptive statistics were used to analyse results.
Results: 65% of participants met the Australian National Guidelines for physical activity of at least 150-300 minutes per week, and 9% of participants reported not doing any physical activity. Walking was the most common activity; participants spent a median time of 60 minutes/day (IQR: 10.0 – 131.25) walking to get to or from places and a median time of 60 minutes/day (IQR: 0 – 150) walking for recreation. Participants spent a median time of 780minutes/day (IQR: 555 -1020) sitting on

weekdays and 600 minutes/day (IQR: 405 - 825) sitting on weekend days. The highest sitting times were for psychological wellbeing interventions (median 121 minutes/day, IQR 3 – 183.5) on a week day and in general relaxation or doing nothing on both weekdays (for each domain median 120 minutes/day, IQR: 60 – 240) and weekend days (for each domain median 120 minutes/day, IQR: 30 – 240). Participants spent a median time of 60 minutes/day (IQR: 0 - 180) watching television on both weekdays and weekend days.

Discussion: Inpatient adults with mental illness can be physically active, with over half meeting the Australian national guidelines. However, they spend a significant amount of time sitting each day. Strategies to reduce time sitting could focus on the contexts of psychological wellbeing interventions, and time spent relaxing or doing nothing.

A.2.2 Title slide

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Physical activity and sedentary behaviour in inpatient adults with mental illness

Sarah Fraser, Justin Chapman, Professor Wendy Brown, Professor Harvey Whiteford, Dr Nicola Burton

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A.3 Conference abstract: Physical activity preferences and attitudes in adults with mental illness at a private psychiatric hospital.

Fraser, S., Brown, W., Whiteford, H., and Burton, N. (2014). Physical activity preferences and attitudes in adults with mental illness at a private psychiatric hospital. (Abstract). *Journal of Science and Medicine in Sport, 18*, e151. The National Physical Activity Conference, Canberra, ACT, Australia, 15th – 18th October, 2014.

A.3.1 Abstract

Introduction: Physical activity may be an effective strategy for managing the poor physical health of adults with mental illness, and has benefits for improving psychological wellbeing. The aim of this study was to determine the physical activity preferences and attitudes of adults with mental illness in an in-patient psychiatric setting.

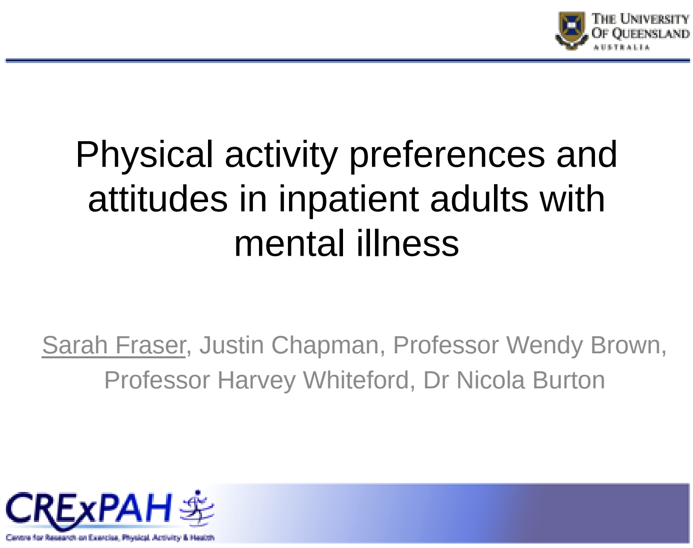
Methods: A total of 101 in-patient adults (23 males, 73 females) aged 18-75 years (mean 40.7 years; SD 14.5) with a mental illness were recruited from a private psychiatric hospital in Brisbane, Australia. Participants completed a written questionnaire and indicated their preferences among 14 types of physical activities and 14 contexts, and the importance of 16 motivators and 16 barriers for physical activity. Responses were rated using a 5-point Likert scale. Participants rated their interest to do physical activity as an in-patient using a scale of 1 to 10, with 10 indicating a high interest. Descriptive statistics were used to analyse results.

Results: Participants expressed a high level of interest (mean 7.70, SD 2.3) to do physical activity as an inpatient, and the primary motivators were to control weight (98%); maintain good health (98%); manage stress (95%), and improve emotional wellbeing (94%). The least endorsed motivator was the social aspect (27%). Participants identified walking (78%), attending the hospital gym (58%) and yoga (56%) as the most preferred physical activity types. They preferred to do physical activity that can be done alone (69%) and at a fixed time (68%) and were least interested in doing physical activity with their own gender (20%). Lack of energy

(76%), feeling too tired (74%) and lack of motivation (73%) were the most commonly reported barriers to physical activity.

Discussion: These results indicate that inpatient adults with mental illness are motivated to engage in physical activity, and that inpatient physical activity programs should focus on walking; and managing weight, physical health, stress and mental wellbeing, with less emphasis on social aspects. Specific strategies are needed to redress fatigue-related barriers. The results from this study can be used to help improve current physical activity opportunities in psychiatric hospitals.

A.3.2 Title slide



A.4 Conference abstract: The feasibility of using questionnaires and accelerometers to measure physical activity and sedentary behaviour among inpatient adults with mental illness.

Fraser, S., Brown, W., Whiteford, H., and Burton, N. (2015). The feasibility of using questionnaires and accelerometers to measure physical activity and sedentary behaviour among inpatient adults with mental illness. The University of Queensland, School of Human Movement and Nutrition Sciences Postgraduate Conference. Stradbroke Island, QLD, Australia, 8th – 10th April 2015.

A.4.1 Abstract

Objective: To assess the feasibility of questionnaires and accelerometers to measure physical activity and sedentary behavior among inpatient adults with mental illness.
Methods: Participants completed questionnaires to assess physical activity and sitting time over a seven-day period, and wore an accelerometer for 24 hours/day for seven consecutive days and completed an activity diary. Feasibility was assessed in terms of participant engagement and self-reported ease/difficulty of completing study components. Adherence to accelerometer wear time criteria was also assessed. Descriptive statistics and Wilcoxin sign rank tests were used to analyse the results.
Results: 101 participants completed the questionnaires, of which 38 also completed the accelerometer and activity diary. 36 (95%) participants met accelerometer wear time criteria. Difficulty ratings were higher for the sitting time and physical activity questionnaires than wearing the accelerometer both during the day ($z=3.787$, $p<0.001$; $z=2.824$, $p=0.005$ respectively) and night ($z=4.171$, $p<0.001$; $z=3.782$, $p=<0.001$, respectively). Difficulty ratings were also higher for completing the activity diary than wearing the accelerometer during the day and night ($z=3.083$, $p=0.002$; $z=3.232$, $p=0.001$ respectively).
Conclusion: Inpatient adults with mental illness can engage with self-report and objective measurements of physical activity and sedentary behavior, with accelerometry being more feasible and acceptable than self-report questionnaires.

A.4.2 Title slide

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The feasibility of using questionnaires and accelerometers to measure physical activity and sedentary behaviour among inpatient adults with mental illness

Sarah Fraser, Professor Wendy Brown,
Professor Harvey Whiteford, Dr Nicola Burton

CRExPAH
Centre for Research on Exercise, Physical Activity & Health

A.5 Conference abstract: Physical activity preferences and attitudes among inpatient adults with mental illness.

Fraser, S., Chapman, J., Brown, W., Whiteford, H., and Burton, N. (2015). Physical activity preferences and attitudes among inpatient adults with mental illness. *International Society of Behavioural Nutrition and Physical Activity Abstract Book*; P1.146: 405. The International Conference for Behavioural Nutrition and Physical Activity. Edinburgh, Scotland, June 3rd – 6th 2015.

A.5.1 Abstract

Objective: Physical activity is effective for managing poor physical health and for improving psychological wellbeing. The aims of this study were to determine the preferences for, barriers to and attitudes towards physical activity among adults with mental illness in an inpatient psychiatric setting and to explore gender differences.
Methods: 101 inpatient adults (72% females, mean 40.7 years; SD 14.5) were recruited from a private psychiatric hospital. Questionnaire items assessed interest in activity; reasons for doing activity; preferences for activity types, contexts and assistance; barriers and general knowledge regarding the benefits of physical activity. Data were analysed using (i) descriptive statistics and (ii) Pearsons chi-square to test for differences by gender.
Results: Participants expressed a high level of interest (mean 7.70, SD 2.3; on a scale of 1-10) in doing activity as an inpatient and the primary reasons were to control weight (98%); maintain good health (98%); manage stress (95%), and improve emotional wellbeing (94%). About two thirds of participants preferred physical activity that they can do on their own (69%), at a fixed time (68%) and with a set routine and format (66%). The most preferred activity type was walking (78%) and preferred sources of assistance were a personal trainer to recommend (28%) and lead (25%) activities and an exercise physiologist to design (32%) activities. Lack of energy (76%), motivation (73%) and feeling too tired (74%) were common barriers. Over 90% perceived that activity is beneficial for managing psychological wellbeing, heart disease, quality of life and stress, however fewer than half perceived

benefits for post-traumatic stress disorder, bipolar affective disorder, chronic fatigue and schizophrenia. Women were more likely than men to prefer activities done with others of the same gender ($p = 0.001$) and activities done with people at the same level of ability ($p < 0.001$).

Conclusions: Inpatient adults with mental illness are interested in physical activity. Programs could focus on walking; emphasise benefits of managing weight, physical health, stress and mental wellbeing, and same gender groups for women. Specific strategies are needed to redress fatigue-related barriers.

A.5.2 Poster

Physical activity preferences and attitudes among inpatient adults with mental illness

THE UNIVERSITY OF QUEENSLAND AUSTRALIA

Sarah J Fraser[1], Justin J Chapman[1], Wendy J Brown[1], Harvey A Whiteford[2], Nicola W Burton[1]

[1] The School of Human Movement and Nutrition Sciences, Brisbane, Australia

[2] The School of Public Health, Brisbane, Australia

Introduction

Physical activity can have a key role in improving the physical and psychological wellbeing of adults with mental illness [1,2]. More information is needed regarding the preferences for and attitudes towards physical activity for inpatient adults with mental illness to inform the development of hospital based physical activity programs.

Purpose

The aims of this study were to determine the preferences for, barriers to and attitudes towards physical activity among adults with mental illness in an inpatient psychiatric setting, and differences by gender.

Methods

Design: Cross-sectional study

Participants: Inpatient adults (N = 101, 18 - 75 years, 72% females, mean age 40.7 years, SD 14.5) with a mental illness from a private psychiatric hospital in Brisbane, Australia

Procedure: Self-administered written survey to assess: (i) interest in activity; (ii) motivators for doing activity; (iii) general knowledge regarding the benefits of physical activity; (iv) preferences for activity types, contexts and sources of assistance; and (v) barriers

Analysis: Data were analysed using: (i) descriptive statistics and (ii) Pearsons chi-square to test for differences by gender

Results

- Participants expressed a **high level of interest** (mean 7.70, SD 2.3; on a scale of 1-10) in doing activity as an inpatient
- **Motivators**: control weight (98%), maintain good health (98%), manage stress (95%) and improve emotional wellbeing (94%)
  - > 90% perceived that **activity is beneficial** for managing psychological wellbeing, heart disease, quality of life and stress
  - < 50% perceived benefits for post-traumatic stress disorder, bipolar affective disorder, chronic fatigue and schizophrenia
- **Preferred activity type**: walking (78%)
- **Context preferences**: activity done alone (69%), at a fixed time (68%) and with a set routine and format (66%)
  - Women were more likely than men to prefer activities done with people at the same level of ability ($p < 0.001$) and activities done with others of the same gender ($p = 0.001$) (Figure1)
- **Preferred sources of assistance**: an exercise physiologist to design (32%) activities and a personal trainer to recommend (28%) and lead (25%) activities
- **Common barriers**: lack of energy (76%), motivation (73%) and feeling too tired (74%)

Conclusions

Hospital based phylscal activity programs could:

- Focus on walking
- Emphasise benefits of managing weight, physical health, stress and mental wellbeing
- Have women only groups
- Highlight the benefits for serious mental illness

Specific strategies are needed to redress fatigue and motivational related barriers

References

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2. Dinas, P. C., Koutedakis, Y., & Flouris, A. D. (2011). Effects of exercise and physical activity on depression. *Irish Journal of Medical Science*, 180(2), 319-325.

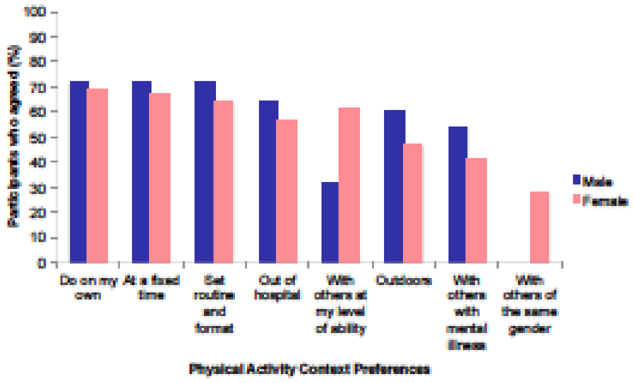

Figure 1: Physical activity context preferences by gender

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A.6 Conference abstract: Physical activity and sedentary behaviour among inpatient adults with mental illness.

Fraser, S., Chapman, J., Brown, W., Whiteford, H., and Burton, N. (2015). Physical activity and sedentary behaviour among inpatient adults with mental illness. *International Society of Behavioural Nutrition and Physical Activity Abstract Book*; P2.187: 4530. The International Conference for Behavioural Nutrition and Physical Activity. Edinburgh, Scotland, June 3rd – 6th 2015.

A.6.1 Abstract

Objective: Physical inactivity and sedentary behavior are positively associated with poor physical health and may contribute to the reduced life expectancy of adults with mental illness. The aim of this study was to assess the physical activity and sedentary behaviour of adults with mental illness in an inpatient psychiatric setting. **Methods:** 101 in-patient adults (72% female) aged 18-75 years (mean 40.7 years; SD 14.5) with a mental illness were recruited from a private psychiatric hospital. Participants reported time spent in walking, moderate and vigorous intensity activity in the past week and domain specific sitting time on a usual weekday and weekend day. 36 participants also provided valid accelerometry data for a minimum of three weekdays and one weekend day. Descriptive statistics were used to analyse results. **Results:** The median self-reported total time spent in physical activity was 225 minutes/week (IQR: 101.25 – 600), and 65% of participants met the physical activity guidelines of at least 150 minutes per week. The median reported time in sedentary behaviour was 780 minutes/day (IQR: 555 -1020) on weekdays and 600 minutes/day (IQR: 405 - 825) on weekend days. The highest reported sitting times were for time spent doing nothing and general relaxing on both weekdays (median 120 minutes/day, IQR: 60 – 240) and weekend days (median 120 minutes/day, IQR: 60 – 240), and time spent with a health professional (median 67.5 minutes/day, IQR 46.25 - 180) on a weekday. Accelerometry results indicated the average time spent in light activity was 111 minutes on weekdays and 126 minutes on weekend days, and in moderate-vigorous intensity activity (MVPA) was 38 minutes on weekdays and 34 minutes on weekend days and the average time spent in sedentary behaviour was 672 minutes/day on weekdays and 648 minutes/day on weekend days.

Conclusions: Inpatient adults with mental illness can be meet recommended levels of physical activity. However, they spend a significant amount of time sitting each day. Strategies to reduce sitting time could focus on the time spent in general relaxation, doing nothing and time spent with a health professional.

A.6.2 Poster

Physical activity and sedentary behaviour among inpatient adults with mental illness

Sarah J Fraser[1], Justin J Chapman[1], Wendy J Brown[1], Harvey A Whiteford[2], Nicola W Burton[1]
[1] The School of Human Movement and Nutrition Sciences, Brisbane, Australia
[2] The School of Public Health, Brisbane, Australia

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Introduction and Purpose

Adults with mental illness have a lower life expectancy and poorer physical health status than the general population [1]. Physical inactivity and sedentary behaviour are positively associated with these poor health outcomes [2,3]. Studies that have reported on the physical activity and sedentary behaviour of adults with mental illness have predominantly been carried out in community settings [4-6].

The aim of this study was, therefore, to assess the physical activity and sedentary behaviour among inpatient adults with mental illness.

Methods

Design: Cross-sectional study

Participants: Inpatient adults (18-75 years; 72% females; mean age 40.7 years, SD 14.5) with a mental illness from a private psychiatric hospital in Brisbane, Australia

Procedure and Measures: Participants (I) completed a self-administered written survey to assess time spent in walking and moderate- and vigorous- intensity activity in the past week, domain specific sitting time on a usual week day and weekend day, psychiatric distress (Kessler 6) and sociodemographic and health characteristics; (n = 101) and (II) wore an Actigraph GT3x accelerometer around their waist for seven consecutive days (n = 36).

Analysis: Descriptive statistics were used to summarise the survey quantitative data (SPSS version 22). Actigraph software was used to analyse the objective physical activity and sedentary behaviour data retrieved from the GT3x accelerometers. Participants' day hours were used to evaluate wear time protocol (at least 10 hours/day, on 4 days of the week, including one weekend day).

Results

- Self-report data indicated that 65% of participants met the guidelines of ≥150 minutes moderate intensity activity/week
- Accelerometry results indicated the average time spent in:
  - **light activity**: 111 mins/weekday; 126 mins/weekend day
  - **moderate-vigorous intensity activity (MVPA)**: 38 mins/weekday and 34 mins/weekend day
  - **sedentary behaviour**: 672 mins/weekday; 648 mins/ weekend day

Table 1: Domain specific self-reported physical activity duration (minutes/week) (n=101)

	Median (IQR)
Walking for transport	60 (10.0 – 131.25)
Walking for recreation and exercise	60 (0 – 150)
Vigorous gardening and yard work	0 (0 – 0)
Vigorous physical activity	0 (0 – 60)
Moderate physical activity	0 (0 – 30)
Total self-reported moderate-vigorous physical activity [a]	225 (101.25 – 600)

Notes
Median reported as 25th and 75th percentile
[a] Total physical activity excludes vigorous gardening and yard work, and has vigorous activity weighted by two.

Table 2: Domain specific self-reported sedentary behavior duration (minutes/day) (n = 101)

	Weekday Median (IQR)	Weekend Median (IQR)
Travelling to and from places	30 (0 – 60)	30 (0 – 60)
Watching television	60 (0 – 180)	60 (0 – 180)
Using a computer	30 (0 – 120)	10 (0 – 120)
Psycho-education group	60 (0 – 120)	0 (0 – 0)
Art therapy group	0 (0 – 120)	0 (0 – 0)
With a health professional [a]	67.5 (46.25 – 180)	20 (0 – 30)
Smoking	0 (0 – 0)	0 (0 – 0)
General relaxing (sitting or lying) [b]	120 (60 – 240)	120 (30 – 240)
Doing work [c]	0 (0 – 60)	0 (0 – 60)
Doing nothing (sitting or lying)	120 (60 – 240)	120 (30 – 240)
Total sedentary behavior time	780 (555 - 1020)	600 (405 - 825)

Notes
Median reported as 25th and 75th percentile
[a] Doctor, Nurse, Psychologist, Social Worker or Occupational Therapist
[b] Example: reading, needle work (not watching television or using a computer)
[c] Example: homework, reading documents, writing NOT using a computer

Conclusions

- Inpatient adults with mental illness can be physically active
- The study population spent a significant amount of time sitting each day, often doing nothing
- The information from this study highlights the need for sedentary behaviour advice, recommendations and interventions for psychiatric inpatients
- Strategies to reduce sitting time could focus on the time spent in general relaxation, doing nothing and time spent sitting with a health professional

References

1. Lawrence, D., Hancock, K., & Kisely, S. (2013). The gap in life expectancy from preventable physical illness in psychiatric patients in Western Australia: retrospective analysis of population based registers. BMJ (Clinical Research Ed.), 346.
2. Nyboe, L., & Lund, H. (2013). Low levels of physical activity in patients with severe mental illness. Nordic Journal of Psychiatry, 67(1), 43-46.
3. van der Ploeg, H. P., Chey, T., Korda, R. J., et al. (2012). Sitting time and all-cause mortality risk in 222 497 Australian adults. Archives of Internal Medicine, 172(6), 494-500.
4. Janney, C. A., Fagiolini, A., Swartz, H. A., et al. (2014). Are adults with bipolar disorder active? Objectively measured physical activity and sedentary behavior using accelerometry. Journal of Affective Disorders, 152-154(0), 498-504.
5. Jerome, G. J., Rohm Young, D., Dalcin, A., et al. (2009). Physical activity levels of persons with mental illness attending psychiatric rehabilitation programs. Schizophrenia Research, 108(1-3), 252-257.
6. Morgan, V. A., Waterreus, A., Jablensky, A., et al. (2012). People living with psychotic illness in 2010: The second Australian national survey of psychosis. Australian and New Zealand Journal of Psychiatry, 46(8), 735-752.

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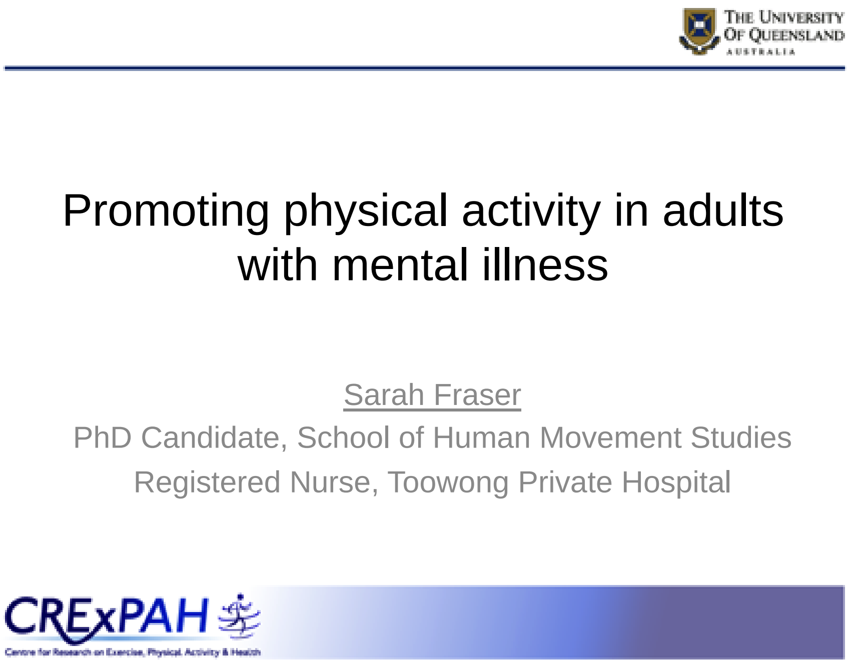
APPENDIX B: Invited presentations

B.1 Invited guest speaker presentation

Fraser, S. (2014). *Promoting physical activity in adults with mental illness*. Mental Health Clinic Collaborative Forum. Queensland Health, Brisbane, Australia, 6th November 2014.



APPENDIX C: Additional published work relevant to this thesis

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C.1 Paper: The feasibility and acceptability of questionnaires and accelerometry for measuring physical activity and sedentary behaviour in adults with mental illness.

This study has been published in the Journal of Mental Health (Impact Factor 1.570).

The citation is as follows:

Chapman, J.J., **Fraser, S.J.,** Brown, W.J., and Burton, N.W. The feasibility and acceptability of questionnaires and accelerometry for measuring physical activity and sedentary behaviour in adults with mental illness. *Journal of Mental Health, 24* (5), 299 – 304.

Abstract

Background*:* Adults with mental illness may have difficulties with data collection methods such as questionnaires and accelerometry.

Aims: To assess the utility of questionnaires and accelerometry for assessing physical activity (PA) and sedentary behaviour (SB) in non-institutionalised adults with mental illness.

Methods*:* Participants were recruited from outpatient clinics and community organisations. Participants completed PA and SB questionnaires, wore accelerometers for 7-days, and rated the ease/difficulty of completing study components. Recruitment numbers, adherence, and ease/difficulty ratings were examined. Ease/difficulty ratings were compared between study components, and between participants by distress level.

Results*:* 142 participants completed the questionnaires; they found it easier to report PA than reclining time (p=.017), and reclining time than sitting time (p<0.001). Participants with high distress found it more difficult to report sitting time and PA than participants with low distress (p<.017). Ninety-nine participants (70%) completed the accelerometry; the majority (88%) met the minimum wear-time criteria. They found it easier to wear the monitor during the day than while sleeping (p<0.001), and easier to complete accelerometry than questionnaires (p<.001).

Conclusions*:* Accelerometry was more feasible for assessing SB than questionnaires. Questionnaires were feasible for assessing PA, but less acceptable for people experiencing high distress.

Introduction

Given the high morbidity and mortality of adults with mental illness (Bloom et al., 2011; Whiteford et al., 2013), it is important to understand the health-related behaviours in this group, such as physical activity (PA) and sedentary behaviour (SB). PA and SB are commonly assessed using questionnaires, due to ease of use and inexpensive administration. These measures are, however, prone to reporting errors such as recall and social desirability bias. Objective methods, such as accelerometers, allow for unbiased measurement, and may have less participant burden than questionnaires. Objective measurement is, however, more expensive and time-consuming, and poor adherence (e.g. from discomfort or forgetting to wear the monitor) may compromise feasibility. Issues of participant burden, recall, and adherence may be particularly relevant for adults with mental illness, due to impairment of memory (Hickie et al., 2005; Jeste et al., 1996), and cognition (Austin et al., 2001; Elvevag et al., 2000; Green, 2006).

Previous studies of PA and SB data collection methods for adults with mental illness have focused on *researcher-centred* aspects, such as validity and reliability (Dubbert et al., 2006; Faulkner et al., 2006; Sharpe et al., 2006; Soundy et al., 2007). Little work has been done on *participant-centred* aspects. One study found that 87.5% of 21 outpatients with schizophrenia were able to wear a pedometer for at least 6 out of 7 days with minimal difficulties (Beebe et al., 2012). We are not aware of studies that have assessed other PA and SB data collection methods for this group. Therefore, the primary aim of this study was to assess the feasibility and acceptability of self-administered questionnaires, and accelerometry for measuring PA and SB in adults with mental illness. A secondary aim was to assess differences in feasibility and acceptability between participants with high or low distress.

Methods

This was a cross-sectional study. There were two recruitment methods: researcher invitation and referral (by self or staff). Individuals were approached by the researcher (JC) in hospital waiting rooms of five outpatient clinics, and support groups of four community-based mental health organisations in Brisbane, Australia, and verbally invited to participate. Project posters were placed in waiting rooms, and interested people could contact the researcher directly, or staff members could refer interested clients. Eligible participants were non-institutionalised men and women who self-identified as recovering from mental illness, were ambulatory, able to understand English, and over 18 years of age. People in visible distress or with severe intellectual impairment were not invited to participate.

Component 1 involved participants reporting PA and SB using self-administered questionnaires, and rating the ease/difficulty of completing these questionnaires on a 7-point Likert scale; higher numbers indicated greater difficulty. The PA questionnaire was adapted from the Active Australia survey (Australian Institute of Health and Welfare, 2004). Respondents reported the total frequency and duration spent in the previous week: a) walking to get to or from places; b) walking for recreation or exercise; c) vigorous garden or yard work; d) vigorous physical activity, and e) other moderate intensity activities. The SB questionnaire was adapted from a sitting-time questionnaire, which asks respondents to report sitting time on a *usual* weekday and weekend day in each of: a) traveling; b) at work; c) watching television; d) computer use; e) leisure time (not including TV) (Marshall et al., 2010). Because SB is typically defined as including time spent reclining as well as sitting (Barnes et al., 2012), an additional item was added to assess reclining time, not including sleep (e.g. lying down due to stress, pain or boredom). Questionnaires were also used to obtain demographic information; participants indicated psychiatric diagnosis from a list of seven options including depression, anxiety (e.g., post-traumatic stress disorder, phobia, panic attacks, obsessive compulsive disorder), psychoses (e.g., schizophrenia, schizoaffective disorder), substance use (e.g., drug, alcohol), eating disorder, bipolar disorder, or other (please specify). Level of distress in the previous month was assessed using the Kessler-6 scale; scores range from 6 to 30, with scores over 15 indicating high distress (Kessler et al., 2002). Participants could complete the questionnaires immediately or take them home; verbal agreement was taken as consent. Participants received an AUD$5 gratuity for completing component 1.

Component 2 involved wearing an ActiGraph GT3X+ accelerometer on the right hip 24 hours/day for seven consecutive days; participants were asked to remove the monitor only to go in water (e.g. shower or swim). During the monitoring period, participants recorded time to bed at night, time out of bed, and times the accelerometer was not worn, in an accompanying diary. At the end of the monitoring period, participants rated the ease/difficulty of wearing the accelerometer during the day or while sleeping, on a 7-point Likert scale; higher numbers indicated greater difficulty. They were also asked how often they: a) recorded every time the monitor was off; b) forgot to put the monitor back on after taking it off; and c) didn't wear the monitor due to discomfort; d) filled out the diary throughout the day as they did the activities; e) filled out the diary at the end of the day from memory; and f) checked a clock, watch or phone for accurate times. Responses were on a 5-point Likert scale (*none*, *a little*, *some*, *most* or *all* of the time). The researcher met participants (often at the participant's residence) to demonstrate how to use the monitor, measure the participants' height and weight, and to pick up the materials. The researcher telephoned participants on the first and last day of the monitoring period to remind them of the requirements, and answer any questions. Participants received a written information sheet, and provided written informed consent before data collection. Participants received an AUD$40 gratuity for completing component 2.

Ethical approval was obtained from The University of Queensland Behavioural and Social Sciences Ethical Review Committee (2012000908), and The Royal Brisbane & Women's Hospital Human Ethical Review Committee (HREC/12/QRBW/286). Data were collected between October 2012 and December 2013.

Data management

Extreme values of self-reported PA were defined as over 840 minutes (14 hours/week) for each domain, and over 1680 minutes (28 hours/week) for total PA, which was calculated as the sum of time spent walking, moderate activity, and vigorous activity weighted by two (excluding gardening), as per standard practices (Australian Institute of Health and Welfare, 2004). Extreme values of self-reported SB were defined as over 10 hours for each domain, and over 20 hours for the sum of time across all domains.

Adherence to the accelerometer protocol was assessed using accelerometer data recorded during participants' *day* hours, defined using self-reported *time out of bed* and *time to bed at night*. Compliance was defined as meeting the minimum wear-time criteria of at least 10 hours/day of valid monitoring, on four days of the week, including at least one weekend day, consistent with previous recommendations (Trost et al., 2005). Accelerometer non-wear time was identified from diaries, and from consecutive zero counts for 60 minutes or longer.

Ease/difficulty ratings were collapsed into *easy* (rating of 1 to 3), *moderate* (rating of 4), and *hard* (rating of 5 to 7). Responses for engagement with the accelerometer study were collapsed into *none*/*a little* (rating 1 or 2), *some* (rating of 3), *most*/*all* (rating 4 or 5), *of the time*.

Data analysis

Due to non-normality and the presence of outliers in ease/difficulty ratings, non-parametric statistical tests were used. The ease/difficulty ratings for each of the study components were compared within participants using Wilcoxon sign rank tests. Mann-Whitney U tests were used to compare ease/difficulty ratings for participants grouped by level of distress, and to compare those who declined or withdrew from the accelerometry, with those who completed. Statistical significance was set at $p<0.05$.

Recruitment numbers, study attrition, adherence to the accelerometer protocol, and extreme values were also examined. Accelerometer data were reduced using Matlab 2011b, and statistical tests were performed using SPSS version 21.

Results

A participant flow diagram is presented in Figure 1. Researcher invitation yielded more participants than self/staff referrals (68% and 58% of the questionnaire and accelerometer completers, respectively), but participants recruited by researcher invitation had a lower completion rate for the combined study components (42% vs. 95%). About a third of individuals who were invited by the researcher consented to the questionnaire (n=137; 36%), 28% of whom subsequently withdrew or were unable to be contacted. Of the individuals invited by the researcher, 98 (26%) completed the questionnaire, and 57 (15%) completed the accelerometry. All 44 participants recruited through *referral* pathways completed the questionnaire, and 42 (95%) completed the accelerometry. When considering recruitment *sources*, similar proportions were recruited from hospital, and community-based settings: 55% and

52% of questionnaire and accelerometer completers respectively were recruited from hospital outpatient clinics.

Total attrition (due to withdrawal or non-response to contact) was lower for the accelerometry than the questionnaire (12% vs 22%). Reasons for voluntary withdrawal included lack of time (n=2), anxiety/paranoia about the accelerometer (n=3), forgetfulness (n=2), self-perceived inability to adhere to the study (n=2) or hospitalisation (n=2). Two participants were withdrawn by clinical staff: one due to exacerbation of eating disorder symptoms, and one due to the staff member considering the participant unsuitable. All participants lost to the accelerometer study had psychotic and/or substance use disorders. Two accelerometers were lost when the participants had a psychiatric admission, and three participants lost activity diaries. Participants' demographic characteristics are presented in Table 1.

Of the 142 questionnaire participants, 32 (23%) requested assistance (e.g. recall prompts) to complete the SB questionnaire, whereas only one person requested assistance to complete the PA questionnaire. Ninety-nine participants completed the accelerometer study, however, one participant's data were lost due to an accelerometer fault, and one participant misunderstood the protocol and only wore the monitor to sleep. Of the 97 participants who wore the monitor during waking hours, 85 (88%) met the wear-time criteria, and 59 (61% of total sample) had 7 out of 7 valid days of monitoring. The median wear-time for all valid days was 14.0 hours (IQR=12.5 to 15.5; max=25.8), which was 98.5% (IQR=95.3% to 100%; min=53.8%) of their reported *day* times. When considering each participant's total reported day time for all valid days, only 5 (6%) participants wore the monitor for less than 90% of this time. The median number of nights that participants wore the monitor to sleep was 8 (IQR=7 to 8) out of a possible 8 nights; four participants chose never to wear the monitor while sleeping.

For total self-reported PA, extreme values were identified for 11% of respondents; more extreme values were identified for walking (6% for *walking for transport*, 5% for *walking for recreation*) than other PA items (<2% each). For total weekday and weekend day SB, extreme values were identified for 7% and 12% of respondents, respectively; more extreme values were identified for *sitting to watch TV* (14%) than other SB domains (<11% each).

Participants' ease/difficulty ratings for completing the questionnaire items and accelerometry tasks are presented in Table 2. Difficulty ratings were significantly higher for reporting sitting time than reclining time or PA, and higher for reporting reclining time than PA. Participants with high distress found it significantly more difficult than participants with low distress to report sitting time and PA. Questionnaire ease/difficulty ratings for those who declined or withdrew from the accelerometry (n=43) were similar to those who completed (sitting: U=2,072, p=.80, r=.02; reclining: U=2,201, p=.74, r=.03; PA: U=2,216, p=0.69, r=.03). Participants found it more difficult to wear the accelerometer while sleeping than during the day; there was no significant difference by distress level. For the 94 participants who completed both study components *and* returned their diary, reporting sitting, and reclining time, were both rated as more difficult than wearing the accelerometer during the day, and while sleeping.

Most participants reported *none* or *a little* of the time when asked how often they forgot to put the monitor back on after taking it off (89%), or how often they didn't wear the monitor due to discomfort (91%). The majority reported completing the diary throughout the day (62%), checking a clock, watch or phone for accurate times (72%), and recording every time the monitor was off (76%), *most* or *all* of the time.

Discussion

The recruitment results highlight the value of working-relationships between researchers and mental health staff/organisations for the engagement of adults with mental illness in research. Some participants experienced great difficulty completing the SB questionnaire, and a higher proportion of respondents reported extreme values for SB items than PA items, which may represent over-reporting. Recalling unstructured behaviours, such as sitting and reclining time, may be more difficult than recalling PA, particularly if asked to average this time for a usual day. Future research could establish standard truncation guidelines for self-reported SB to minimise potential over-reporting, and investigate the ease/difficulty of *previous day* recall questions with time- and domain-specific prompts, rather than *usual day* questions.

Participants engaged well with the accelerometer protocol. The compliance observed in our study (88%) is similar to general population studies, e.g. 77% for a Swedish study (Hagströmer et al., 2007), and 76% for the 2003-2004 NHANES sample (Troiano et al., 2008). A Hong Kong study of 3,600 adults found that 60% of participants provided 4 days of valid monitoring, and that accelerometer wear time was positively associated with full-time employment, non-smoker status, tertiary education, and high self-reported health (Lee et al., 2013). Our study however, demonstrated high compliance from a sample with a high unemployment (88% not working), current smoking status (56%), low tertiary education (14%) and poor health (71% low rated health). This high compliance may be explained by aspects of the protocol, which have been shown to improve compliance in other populations, such as a daily log, follow-up phone calls during the monitoring period, and a financial gratuity (Sirard et al., 2009), however, people with psychotic and/or substance disorders may be more likely to withdraw.

A strength of this study is the large, heterogeneous sample recruited from both community and hospital settings; other studies have involved smaller samples (ranging from 14 to 35) recruited from a single site (Beebe et al., 2012; Dubbert et al., 2006; Faulkner et al., 2006; Soundy et al., 2007), or involved a single diagnostic group (Beebe et al., 2012; Dubbert et al., 2006; Faulkner et al., 2006). SB is typically defined to include time spent reclining as well as sitting (Barnes et al., 2012), and previous research has highlighted the non-assessment of reclining time as a source of bias when assessing SB in adults with mental illness (Northey et al., 2012). The inclusion of reclining time may have, however, increased participants' perceived difficulty of completing the questionnaire. A limitation of this study is that a convenience sample was used instead of a random sample; therefore our sample may not be representative. The high proportion of adults with psychotic illnesses in our study may make the results broadly generalizable to a cohort with mental illness. Because participants completed accelerometry after the questionnaires, it may be that participants who had greater difficulty with questionnaires were more likely to decline the accelerometry, thus biasing the accelerometry sample to the "more capable”. However, questionnaire ease/difficulty ratings for participants who declined or withdrew from the accelerometry were similar to those who completed.

In conclusion, adults with mental illness can engage with self-report and objective methods of collecting data on PA and SB. Accelerometry was more feasible and acceptable for assessing SB than questionnaires. Questionnaires were feasible for assessing PA, but may be less acceptable for people experiencing high distress.

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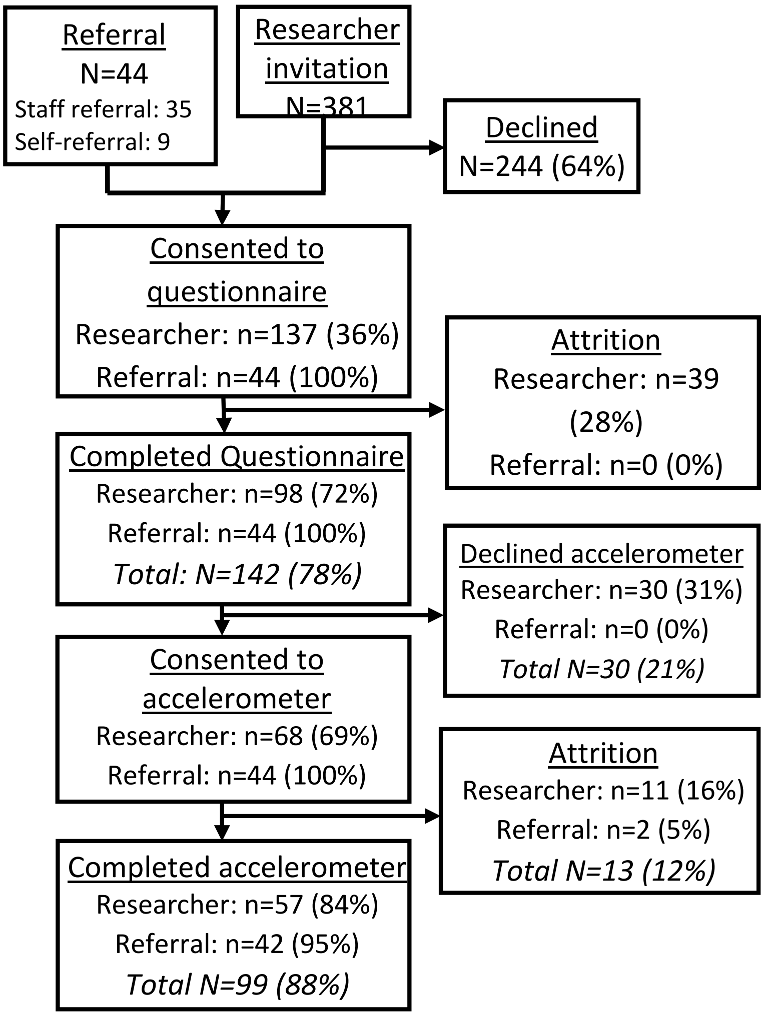

Figure 1: Participant flow diagram. There were two recruitment methods: verbal invitation by the researcher (*researcher invitation*) and self- or staff-referral (*referral*).

Table 1

Participant Characteristics

	Questionnaire (n=142)	**Completed accelerometry** (n=99)	**Did not complete accelerometry** [a] (n=43)
Age mean (SD)	40.0 (11.4)	40.1 (11.4)	39.8 (11.6)
	n (%)	**n (%)**	**n (%)**
Female n (%)	61 (43%)	46 (47%)	15 (35%)
Diagnosis			
Depression	13 (9%)	9 (9%)	4 (9%)
Anxiety	5 (4%)	4 (4%)	1 (2%)
Depression/anxiety	14 (10%)	9 (9%)	5 (12%)
Psychoses	46 (32%)	28 (28%)	18 (42%)
Psychoses *and* depression/anxiety	18 (13%)	11 (11%)	7 (16%)
Bipolar	10 (7%)	10 (10%)	0 (0%)
Other [b]	36 (25%)	28 (28%)	8 (19%)
Distress [c]			
High distress	64 (45%)	43 (43%)	21 (49%)
Education			
<Year 12	53 (37%)	34 (34%)	19 (44%)
Year 12	27 (19%)	21 (21%)	6 (14%)
Certificate/diploma	40 (28%)	30 (30%)	10 (23%)
University degree	22 (16%)	14 (14%)	8 (19%)
Employment			
Full-time/part-time	17 (12%)	12 (12%)	5 (12%)
Volunteer	13 (9%)	8 (8%)	5 (12%)
Student	14 (10%)	9 (9%)	5 (12%)
Homemaker/retired	10 (7%)	8 (8%)	2 (5%)
Unable to work	59 (42%)	41 (41%)	18 (42%)
Unemployed / looking for work	29 (20%)	21 (21%)	8 (19%)
Physical health			
Poor/fair	94 (66%)	70 (71%)	24 (56%)
Good	36 (25%)	23 (23%)	13 (30%)
Very good/excellent	12 (9%)	6 (6%)	6 (14%)
Smoker status			
Daily/occasionally	85 (60%)	56 (57%)	29 (67%)
Never/ex-smoker	57 (40%)	43 (43%)	14 (33%)

[a] Includes participants who declined (n=30) or withdrew (n=13) from the accelerometry.

[b] *Other* includes participants with a range of diagnoses e.g. depression, anxiety, eating disorder, and substance use (n=2); depression anxiety, substance use and psychoses (n=3) etc.

[c] Distress was measured using the Kessler-6 distress scale; high distress is a score over 15.

Table 2

Ease/Difficulty Ratings for Study Components

	Ease/difficulty ratings n (%) for all participants			**Ease/difficulty ratings** median (25^{th}, 75^{th} percentile)		
	Easy	**Moderate**	**Hard**	**All participants**	**Low distress**	**High distress**
Questionnaire (n=142)					**n=78**	**n=64**
Physical activity*	65 (46%)	29 (20%)	48 (34%)	4 (1, 5)	3.5 (1, 5)	4 (2, 6)
Reclining [a]	46 (32%)	31 (22%)	65 (46%)	4 (2, 5)	4 (2, 5)	5 (3, 6)
Sitting* [b]	30 (21%)	22 (16%)	90 (63%)	5 (4, 7)	5 (3.75, 6)	6 (4, 7)
Wearing monitor (n=94)					**n=54**	**n=40**
During day	79 (84%)	8 (9%)	7 (7%)	1 (1, 2.25)	1 (1, 2)	1.5 (1, 3)
While sleeping [c]	67 (71%)	10 (11%)	17 (18%)	2 (1, 4)	2 (1, 4)	2 (1, 4.75)

*Participants with *high* distress had greater difficulty than those with *low* distress to report physical activity (U=1992.5, p=.036, r=0.18), and sitting time (U=1840, p=.006, r=0.23).

[a] Greater difficulty than PA (Z=2.313, p=.017); greater difficulty than wearing the monitor during the day (Z=6.678, p<.001), or night (Z=4.708, p<.001).

[b] Greater difficulty than reclining (Z=5.797, p<.001) and PA (Z=6.233, p<.001); greater difficulty than wearing the monitor during the day (Z=7.499, p<.001), or night (Z=6.310, p<.001).

[c] Greater difficulty than during the day (Z=3.704, p<.001).

C.2 Paper: Physical activity and sedentary behavior of adults with mental illness

This study has been published (online ahead of print) in the Journal of Science and Medicine in Sport (Impact Factor 3.194).

The citation is as follows:

Chapman, J.J., **Fraser, S.J.,** Brown, W.J., and Burton, N.W. Physical activity and sedentary behavior of adults with mental illness. *Journal of Science and Medicine in Sport*. First published online 30 July 2015. doi 10.1016/j.jsams.2015.07.017.

Abstract

Objectives: To assess physical activity (PA) and sedentary behaviour (SB) in non-institutionalised adults with mental illness, using a combination of self-report and objective measures.

Design: Cross-sectional.

Methods: Participants completed PA questionnaires (time spent walking for transport, walking for recreation, gardening, vigorous-, and moderate-intensity activities), and SB questionnaires (time spent sitting for TV, travel, work, computer use; and reclining). Participants also wore an accelerometer for 7-days. Accelerometry estimates of time spent in SB, light activity, and moderate-to-vigorous activity (MVPA), bout durations, and breaks in sedentary time were calculated.

Results: 142 participants completed the questionnaires. The median time spent in self-reported MVPA and SB was 4.5 hours/week and 10.7 hours/day respectively. Walking for transport, and sitting to watch TV, contributed most to self-report estimates; time spent reclining was an important contributor to SB. 99 participants completed the accelerometry. The median time spent in accelerometer-derived MVPA and SB was 26 minutes/day and 9.2 hours/day respectively; 7% of MVPA time was in bouts of 10 minutes or more, and 34% of SB time was in bouts of over 20 minutes.

Conclusions: A high proportion of participants reported activity levels consistent with physical activity guidelines; however, a small proportion of activity was accumulated in bouts of 10 minutes or more. Participants also had high levels of SB, about one-third of which was accumulated in bouts over 20 minutes. PA and SB interventions for this group could target increasing recreational walking, and reducing television time.

Introduction

Adults with mental illnesses have a shorter life expectancy than the general population[1], and increased risk of chronic disease[2]. Physical activity (PA) can protect against these outcomes[3], and reduce depression and anxiety[4]. High levels of sedentary behaviour (SB) are associated with increased risk of morbidity and all-cause mortality[5], and may also be associated with poor mental health[6]. It is therefore important to understand the levels of PA and SB of adults with mental illness.

Most studies of PA and SB in adults with mental illness have used self-report measures only. These studies have commonly assessed the frequency (e.g. times/week) and intensity of activities[7-9], or have only reported categories of total activity[2,10]. Few studies have reported on the self-reported *duration* of PA[11,12], which is important for determining adherence to PA guidelines, and identifying the most common contexts of PA participation. A questionnaire study with 21 community-based adults with mental illness reported that walking comprised the greatest, and leisure-time activity the lowest, proportion of moderate-to-vigorous physical activity (MVPA)[11]. Another questionnaire study with 194 outpatients with schizophrenia, found low engagement in leisure-time sports, and similar self-reported values for weekdays and weekend days: ~12.6 hours/day in sedentary *and* light (e.g. driving, shopping), ~1.3 hours/day in moderate, and ~0.3 hours/day in vigorous activities[12]. This study assessed combined sedentary and light activities[12]; however, distinguishing SB from light activity is important, given the different health-related implications[5]. One study assessed self-reported SB, which found average sitting times of 5.1 hours/day[11]; this study did not assess domain-specific sedentary behaviours, or time spent reclining. Self-report methods are, however, prone to reporting errors such as recall and social desirability bias[13].

Objective methods, such as accelerometry, allow for unbiased measurement, but few studies have used these in adults with mental illness. Accelerometry studies with sample sizes ranging from 46[14] to 165[15] have reported mean times spent in SB ranging from 9.1 to 13.5 hours/day[14-16], and MVPA ranging from 14 to 42 minutes/day[14-17] Two studies also assessed bout durations of SB and MVPA: one found that adults with depression and/or anxiety accumulated 42% of SB in ≥20 minute bouts, and 43% of MVPA in ≥10 minute bouts[15]; the other found that only 4%

of a sample of adults with mental illnesses who'd accumulated at least 150 minutes/week of MVPA, did so in ≥10 minute bouts[17]. These studies have typically focused on samples of adults with specific psychiatric diagnoses, e.g. schizophrenia[14], depression and/or anxiety[15], and bipolar disorder[16]; one study was with adults with a range of diagnoses[17]. Accelerometry does not provide contextual information about PA and SB, which can be useful for intervention planning; for example, if active transport is found to be high, PA interventions may target recreational activity.

Using a combination of self-report and objective measures may provide more comprehensive assessment; however, few studies have done so. One study with 54 adults with schizophrenia, found that participants reported a mean of 11.2 hours/week in PA (including low intensity), and that the most commonly reported activity was walking[18]. This questionnaire also assessed sitting time, however, this was operationalised as a 'sitting index', which does not provide information about the duration or context of sedentary behaviours. Accelerometer data from 16 participants indicated that 8.9 hours/day was spent in SB, 32 minutes/day in moderate, and 4 minutes/day in vigorous activity[18].

Previous research suggests high levels of SB in adults with mental illness, with lower estimates from self-report measures than accelerometry (5.1 vs. ≥8.9 hours/day). Conversely, self-reported MVPA tends to be higher than accelerometry (~1.6 hours/day vs. ≤42 minutes/day). Differences in PA and SB estimates across studies could be due to differences in samples (e.g. diagnoses), or measures used. Most studies have been with participants with a specific diagnosis; assessing PA and SB in diagnostically heterogeneous groups is important, because PA and SB intervention can benefit adults with a broad range of mental illnesses[19]. More research using self-report and objective measures with adults with mental illnesses is therefore needed to provide insight into how (e.g. bout durations, break frequency, measured intensity etc.), and in what context, PA and SB is accumulated for this group.

The aim of this study was to assess the PA and SB of adults across a range of mental illnesses, using self-report and objective methods.

Methods

Ethical approval was obtained from The University of Queensland Behavioural and Social Sciences Ethical Review Committee (2012000908), and the Royal Brisbane & Women's Hospital Human Ethical Review Committee (HREC/12/QRBW/286). Data were collected between October 2012 and December 2013.

This was a cross-sectional study. Individuals were approached in waiting rooms of five psychiatric outpatient clinics, and support groups of four community-based mental health organisations in Brisbane, Australia, and verbally invited to participate. Project posters were placed in waiting rooms, and interested people could contact the researcher directly, or staff members could refer interested clients. Eligible participants were non-institutionalised men and women who self-identified as recovering from mental illness, were ambulatory, able to understand English, and over 18 years of age. People in visible distress or with severe intellectual impairment were not invited to participate.

There were two study components; component 1 involved reporting PA and SB using self-administered questionnaires. Participants could complete the questionnaires immediately or take them home; verbal agreement was taken as consent. Participants received an AUD$5 gratuity upon completion.

The PA questionnaire was adapted from the Active Australia survey to have two walking items[20]. Respondents reported the total frequency and duration in the previous week of: a) walking for transport; b) walking for recreation; c) vigorous yard work; d) vigorous activity, and e) other moderate intensity activities. This version of the questionnaire has been shown to have moderate correlations with accelerometry (ρ=0.43–0.52) for mid-aged women[21]. Consistent with other state and national physical activity surveys, self-report data were truncated to limit potential over reporting[20]. Self-reported activity for *each questionnaire item* was truncated to 14 hours/week[20]. Self-reported moderate-to-vigorous activity in the previous week (Sr-MVPA/week) was calculated as the sum of time spent in walking (for transport and recreation/exercise), moderate activity, and vigorous activity weighted by two (excluding yard work), and truncated to 28 hours/week[20]. Participants who reported at least 150 minutes of Sr-MVPA/week were classified as meeting PA guidelines[22].

The SB questionnaire was adapted from a questionnaire which asks about sitting time on each of a usual weekday and weekend day, in each of: a) traveling; b) at work; c) watching television; d) computer use; e) leisure time (not including TV)[23]. The questionnaire has been shown to have high validity for sitting at work and computer use (r=0.69–0.74), for mid-aged adults[23]. Because SB is typically defined to include reclining time, an additional item was added to assess reclining time, not including sleep (e.g. lying down due to stress, pain or boredom). Self-reported sedentary time for each questionnaire item was truncated to 12 hours/day, with the exception of s*itting for travel,* which was truncated to 8 hours/day. Individual questionnaire items were summed for weekdays and weekend days, and self-reported sedentary behaviour in a usual day (Sr-SB/day) was calculated as (*usual weekday**5+*usual weekend**2)/7, and truncated to 20 hours/day.

Component 2 involved wearing an ActiGraph GT3X+ accelerometer on the right hip, 24 hours/day for seven consecutive days. During the monitoring period, participants recorded time to bed, time out of bed, and non-wear times, in a diary. The researcher (JC) met participants to demonstrate how to use the monitor, and measure height and weight. Accelerometer data from two pilot participants were included in the analysis. Participants provided written informed consent before data collection, and received an AUD$40 gratuity upon completion.

Accelerometer vertical axis data were converted to counts per minute (cpm). Participants' self-reported time out of bed, and time to bed, were used to define their *waking* hours; only waking data were analysed. Accelerometer non-wear time was identified from diaries, and from consecutive zero counts ≥60 minutes. Data were considered valid if the accelerometer was worn for at least 90% of waking hours on at least four days of the week, including at least one weekend day.

Accelerometer-derived sedentary behaviour (Ac-SB), light, and moderate-to-vigorous activity (Ac-MVPA), were defined as ≤100 cpm, 101–2,019 cpm, and >2,019 cpm, respectively. *Daily averages* of Ac-SB and Ac-MVPA (Ac-SB/day and Ac-MVPA/day) were calculated. For ease of comparison with Sr-MVPA/week, Ac-MVPA/day was converted to a weekly measure, by multiplying by seven (Ac-MVPA/week).

Bouts of Ac-MVPA and Ac-SB were defined as successive accelerometer data above, and below, their respective thresholds (>2,019 cpm, and ≤100 cpm). Bouts of Ac-MVPA 10 minutes or longer were identified, consistent with some PA recommendations[24], and bouts of Ac-SB longer than 20 minutes were identified as *prolonged* bouts, given that breaks in sedentary time every 20 minutes can confer health benefits[25]. The data between successive Ac-SB bouts (≥1-minute) were defined as sedentary breaks; the mean number, duration, and intensity of sedentary breaks, were calculated[26].

Demographic questionnaires were used in both study components. Participants indicated psychiatric diagnosis from a list of: depression, anxiety (e.g., post-traumatic stress disorder, panic attack, obsessive compulsive disorder, generalised anxiety disorder), psychoses (e.g., schizophrenia, schizoaffective disorder), substance use (e.g., drug, alcohol), eating disorder, bipolar disorder, or other (please specify). Level of distress was assessed using the Kessler-6 scale; scores range from 6 to 30, with scores over 15 indicating high distress[27].

Participants' demographic characteristics were compared across study components using chi-squared and t-tests. Wilcoxon signed-rank tests were used to compare the reported frequencies, and truncated durations of questionnaire items. Due to the potential for researcher administration to influence self-report results, questionnaire data for participants who requested assistance were compared with those that self-administered, using Mann-Whitney tests. Accelerometer-derived outcomes were weighted by the number of valid days of accelerometry for each participant, to generate group summary statistics. Spearman's rank order correlations and Wilcoxon tests were used to compare Sr-MVPA/week with Ac-MVPA/week; because SB data were normally distributed, t-tests were used to compare Sr-SB/day with Ac-SB/day. Accelerometer data reduction was performed using Matlab 2011b, and SPSS v.22 was used to generate descriptive statistics and perform statistical tests.

Results

Of the 425 individuals invited or referred to the study, 142 (33%) completed the questionnaires, 55% of whom were recruited from hospital sites; no information is available on those who declined. Most questionnaire participants (79%; n=112) consented to the accelerometer component; attrition for the accelerometry was 12%. Of those who completed the accelerometry, 47% were recruited from hospital sites. Participants who completed the accelerometry were similar on age (mean=40 vs. 40 years), sex (female=47% vs. 35%), BMI (mean=30 vs. 26), and distress (mean=15 vs. 16) to those who declined *or* withdrew, and less likely to have a psychotic or substance use disorder (56% vs 100%; p=0.003) than those who withdrew. Just under half of the sample reported multiple psychiatric diagnoses; the most common co-occurring diagnosis was depression, followed by anxiety. Demographic characteristics are summarised in Table 1.

Self-reported PA statistics are summarised in Figure 1. One participant was unable to provide responses, therefore 141 questionnaires were analysed. Truncation was applied to 5.7%, 5.0%, 1.4%, 1.4%, and 2.1% of responses for the items *walking for transport*, *walking for recreation*, *yard work*, *vigorous activity*, and *moderate activity*, respectively; Sr-MVPA/week was truncated for 11.3% of participants. For each of these items, truncated values ranged from: 14-70, 16-60, 40-100, 18-200, 18-100, and 28-70 hours/week, respectively. The median Sr-MVPA/week was 4.5 hours/week (IQR=1.8-12). Respondents reported a higher frequency (sessions/week) for *walking for transport* than other PA items (p<0.001). Longer durations were also reported for *walking for transport* than other PA items (p<.001), with a median of 2 hours/week (IQR=0.7-5). At least 150 minutes/week of Sr-MVPA/week was reported by 99 (70%) participants, 74 (52% of total) of whom reported doing so in 5 or more sessions. Few participants (7%) reported no activity.

Self-reported SB summary statistics are presented in Figure 1. One-fifth of participants (n=29) requested assistance (e.g. recall prompts) to complete the SB questionnaire, four of whom were unable to provide responses. The 25 participants who provided SB data, and requested assistance, reported similar sedentary times (for each domain, and total) to those who did not request assistance (p>.12); data from all participants who provided responses were therefore included in the analyses (n=138). Truncation was applied to 2.2%, 2.2%, 1.4%, 0%, 0%, and 0.7%, of responses for the items: *sitting to watch TV*, *sitting for travel*, *lying down (not sleep)*, *sitting at a computer*, *sitting for work,* and *sitting for other reasons*, respectively; Sr-SB/day was truncated for 6.5% of participants. For each of these items, truncated values ranged from: 12-15, 8-19, 15-22, NA, NA, 14-14, and 21-35 hours/day, respectively. The median Sr-SB/day was 10.3 hours/day (IQR=6.3-14.5). The most frequently reported behaviours were: sitting for *travel* (96%), sitting *to watch TV* (88%), and sitting for *other reasons* (87%). Longer durations were reported for sitting to watch TV, than for other domains ($p<0.001$), with a median of 2.8 hours/day (IQR=1.3-4.6). Time spent reclining contributed more to Sr-SB/day than sitting at work, $Z=6.686$, $p<0.001$, or computer use, $Z=2.354$, $p=0.019$.

One participant's accelerometer data were lost due to an accelerometer fault, and one participant only wore the monitor to sleep. Of the 99 participants who wore the monitor during waking hours, 75 (76%) met the minimum wear-time criteria; these participants were older than those without valid data (mean=42 vs. 34 years; $p=.002$), but similar on sex (female=47% vs. 50%), BMI (mean=30 vs. 31), and distress (mean=15 vs. 16). The median number of valid days for these participants was 6 (IQR=6-7), and the median proportion of waking hours that participants wore the monitor was 98% (IQR=97-99%; range=93-100%). Participants spent a median of 26 minutes/day (IQR=12-52) in MVPA (3%, IQR=1-7% of wear-time), 7% (IQR=0-21%) of which was accumulated in ≥10 minute bouts. Light activity accounted for just under a third of wear-time (Med=30%, IQR=25-38%). Participants spent a median of 9.2 hours/day (IQR=7.9-10.6) sedentary (65%, IQR=58-72% of wear-time), over a third of which (Med=34%, IQR=25-42%) was accumulated in >20 minute bouts. Participants recruited from community-based sites had higher SB, $U=925$, $p=.017$, $r=.28$, and lower MVPA, $U=503$, $p=.036$, $r=.24$, than those recruited from hospital sites. The median number of sedentary breaks/day was 87 (IQR=77-102), the median break length was 3.3 (IQR=2.7-3.9) minutes, and the median break intensity was 533 (IQR=438-619) cpm, which is light intensity.

Of the 75 participants who met the minimum wear-time criteria, 73 completed the PA questionnaire, and 71 completed the SB questionnaire; self-report and accelerometry estimates of PA and SB were compared for participants that provided valid data for both measures. Graphical comparisons of Sr-MVPA/week and Ac-MVPA/week, and Sr-SB/day and Ac-SB/day, are presented in Figure 2. Sr-MVPA/week was higher than Ac-MVPA/week, $Z=3.604$, $p<0.001$, and moderately correlated, $r_s(71)=0.44$, $p<0.001$. Sr-SB/day was higher than Ac-SB/day, $t(70)=2.70$, $p=0.009$, $d=0.42$, without significant correlation, $r(69)=.21$, $p=0.08$.

Discussion

Most participants (70%) self-reported at least 150 minutes/week of MVPA. Other studies have found a lower proportion meeting PA recommendations, however, researchers have operationalised “recommendations” differently, e.g. one study reported that 39% of their sample engaged in at least 20 episodes of PA per month[8]. The Active Australia survey has not been validated in adults with mental illness, and Sr-MVPA/week was truncated for more than 10% of participants, indicating that over-reporting may be high. We truncated self-report data consistent with the guidelines for the questionnaire, however, we are not aware of studies on the appropriateness of the specific truncation values for adults with mental illness. The most common type of activity was walking for transport, which is in agreement with other research[8,11,18]. PA interventions for adults with mental illness could target increasing *recreational* walking. Future research could investigate walking cadence, given previous research indicating its impact on health[28].

Questionnaire data indicated that participants were highly sedentary. Our study is the first to report SB in six domains, including time spent reclining. Sitting to watch TV contributed most to SB, and sitting for travel was most frequently reported. Reclining time, not including sleep, was an important contributor to SB, more so than sitting for work or computer use, which may be due to low rates of employment. The SB questionnaire has not been validated in adults with mental illness, and truncation was applied to more than 6% of responses, potentially indicating over-reporting. High levels of SB in adults with mental illness could be due to medication side-effects (e.g. lethargy, weight gain), symptoms of mental illness (e.g. avolition, anhedonia, psychomotor retardation), and socio-behavioural issues (e.g. social isolation, low self-esteem or self-confidence). Reducing or breaking-up reclining and TV time could be a target of SB interventions for this group.

Our study extends previous accelerometry research by assessing bout characteristics: one third of SB was accumulated in prolonged bouts, and participants tended to break up SB with short bouts of light activity, which may have health implications, given that previous research has shown that interrupting SB every 20 minutes is beneficial[25]. Only a small proportion of accelerometer-derived MVPA time was accumulated in at least 10 minute bouts, indicating that participants may report short-duration bursts of incidental activity. In our study, self-reported MVPA was greater than accelerometer-derived MVPA; however, our questionnaire asked about the week preceding the accelerometry period, and may reflect actual differences in behaviour. The poor correlation between self-report and accelerometry measurements of SB may indicate difficulties using SB questionnaires in this group[29].

A strength of this study is the diagnostically heterogeneous sample recruited from both community and hospital settings, which increases generalizability; however, a convenience sample was used instead of a random sample, therefore our sample may not be representative. This heterogeneity likely contributed to the differences in self-reported and accelerometer-derived PA and SB between this and previous studies. Differences in self-report data across studies could also be due to different recall periods; we asked about PA in the previous week, while others have asked about a usual day[12], and a typical week[18]. Comparability across studies would be enhanced by use of standardised PA and SB questionnaires designed for use, and validated, with adults with mental illness.

Conclusions

Adults with mental illness spend about two-thirds of their waking time sedentary, a third of which is accumulated in prolonged bouts. Watching TV contributes most to SB, and time spent reclining is an important contributor to SB. The most common activity was walking; few participants engaged in other moderate or vigorous activities. In view of the demonstrable mental health benefits of PA, people involved in the care of adults with mental illness should encourage replacing some sedentary activities with moderate-vigorously active pursuits.

Practical implications

- A high proportion of adults with mental illness report levels of moderate-to-vigorous activity consistent with recommendations, primarily due to walking for transport.
- Exercise interventions for this group could target increasing recreational walking.
- Adults with mental illness report high levels of sedentary behaviour, primarily from TV time.
- Sedentary behaviour interventions for this group could target breaking up prolonged television viewing.

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Declaration of Conflicting Interests

The Authors declare that there is no conflict of interest.

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Table 1.

Participant characteristics

	Questionnaire (n=142)	**Accelerometer** (n=101)
Age in years; mean (SD)	40.1 (11.5) range=18-71	40.3 (11.4) range=18-71
	n (%)	**n (%)**
Female	61 (43%)	47 (47%)
Self-reported diagnosis		
Number of diagnoses reported		
1	75 (53%)	54 (53%)
2	42 (30%)	29 (29%)
3-5	25 (17%)	18 (18%)
Single diagnosis reported		
Psychoses	46 (33%)	29 (29%)
Depression	12 (10%)	9 (9%)
Bipolar	10 (7%)	10 (10%)
Anxiety	5 (4%)	4 (4%)
Substance use	1 (1%)	1 (1%)
Eating disorder	0 (0%)	0 (0%)
Other (personality disorder)	1 (1%)	1 (1%)
Multiple diagnoses reported [a]		
Depression	55 (39%)	42 (38%)
Anxiety	38 (30%)	32 (32%)
Psychoses	31 (22%)	17 (17%)
Substance use	17 (12%)	13 (13%)
Other [b]	9 (6%)	7 (7%)
Bipolar	7 (5%)	7 (7%)
Eating disorder	7 (5%)	4 (4%)
Distress [c]		
High distress	64 (45%)	44 (44%)
Education		
Did not complete high school	53 (37%)	34 (34%)
High school	27 (19%)	22 (22%)
College certificate/diploma	40 (28%)	31 (31%)
Tertiary degree (University)	22 (16%)	14 (14%)
Employment		
Full-time/part-time	17 (12%)	12 (12%)
Volunteer	13 (9%)	9 (9%)
Student	14 (10%)	9 (9%)

Homemaker/retired	10 (7%)	8 (8%)
Unable to work	59 (42%)	41 (41%)
Unemployed / looking for work	29 (20%)	22 (22%)
Physical health		
Poor/fair	94 (67%)	72 (72%)
Good	36 (25%)	23 (23%)
Very good	12 (9%)	6 (6%)
Smoker status		
Daily/occasionally	85 (60%)	57 (57%)
Never/ex-smoker	57 (40%)	44 (44%)
BMI (kg/m^2) [d]		
<18.5	-	2 (2%)
18.5 – 24.9	-	19 (19%)
25 – 29.9	-	31 (31%)
>30	-	49 (50%)

[a] Individual diagnoses reported by those who reported multiple diagnoses, hence, the proportions sum to greater than 100%.

[b] *Other* reported diagnoses were personality disorder for all but two participants from both the questionnaire and accelerometer sample: one reported attention deficit hyperactivity disorder (ADHD), the other reported Asperger's syndrome.

[c] Distress was assessed using the Kessler-6 scale; scores range from 6 to 30, with scores over 15 indicating high distress[24].

[d] BMI: Body Mass Index calculated as weight (kg) / height $(m)^2$. Height and weight were measured for participants of accelerometer study only.

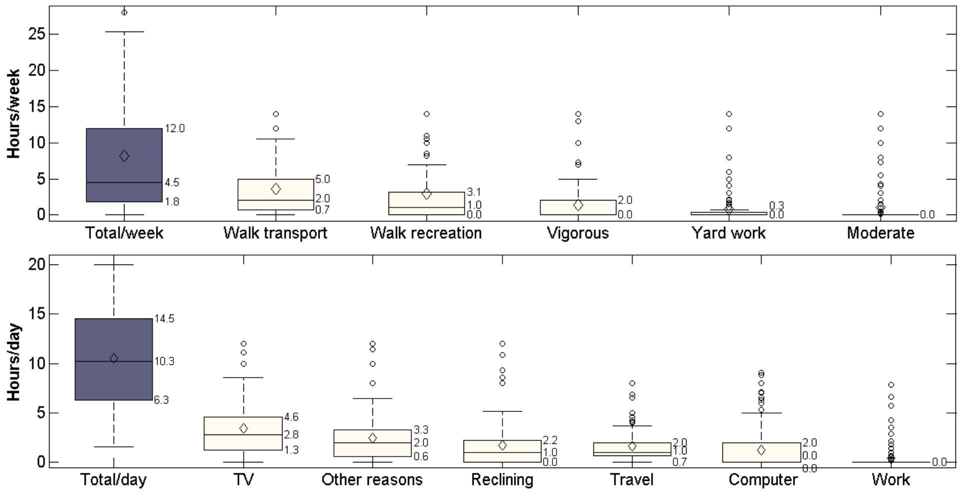

Figure 1 - Lower and upper whiskers represent the outermost datum within 1.5 x interquartile range (IQR) from the 1st and 3rd quartile, respectively; numbers next to the median line, and box edges, represent the median value, and 25th-75th percentiles; diamonds represent the mean, and circles represent outliers. **Upper panel:** Durations of self-reported physical activity in the previous week (n=141). Light grey boxplots represent self-reported durations for each of the five questionnaire items; the dark grey boxplot represents *total* self-reported moderate-to-vigorous activity in the previous week (Sr-MVPA/week), calculated as the sum of walking (for transport or recreation), vigorous activity, and moderate activities. **Lower panel:** Durations of self-reported sedentary behaviour in a usual day (n=138). Light grey boxplots represent self-reported durations for each of the six questionnaire items; the dark grey boxplot represents *total* self-reported sedentary behaviour for a usual day (Sr-SB/day), calculated as the sum of all six questionnaire items.

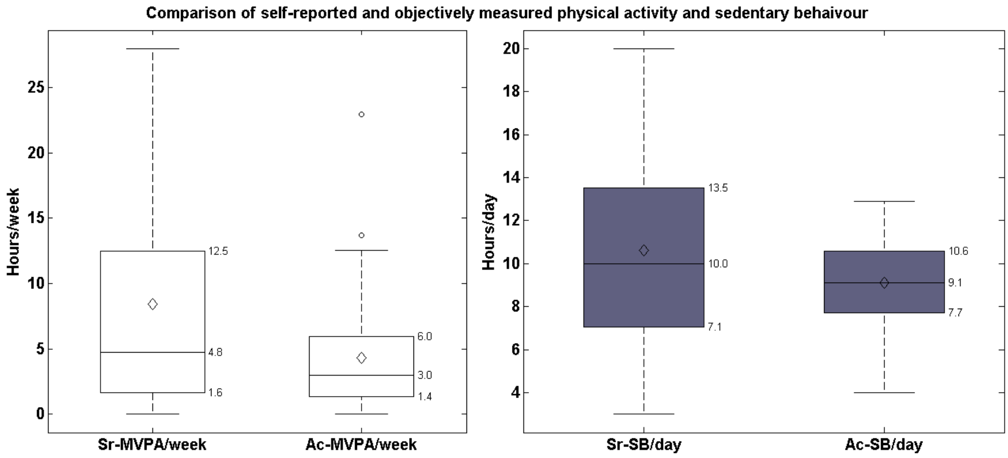

Figure 2 – Lower and upper whiskers represent the outermost datum within 1.5 x interquartile range (IQR) from the 1st and 3rd quartile, respectively; numbers next to the median line, and box edges, represent the median value, and 25th-75th percentiles. Diamonds represent the mean, and circles represent outliers. **Left panel***:* Comparison of estimates of moderate-to-vigorous activity for the 73 participants who provided valid data for both the accelerometer and questionnaire: **a)** Self-reported moderate-to-vigorous activity for the week preceding accelerometry (Sr-MVPA/week); mean=8.5 hours/week (SD=8.8); **b)** Accelerometer-derived moderate-to-vigorous activity per week (Ac-MVPA/week); mean=4.3 hours/week (SD=4.0). **Right panel:** Comparison of estimates of sedentary behaviour for the 71 participants who provided valid data for both the accelerometer and questionnaire: **c)** Self-reported sedentary behaviour in a usual day (Sr-SB/day); mean=10.6 hours/day (SD=4.7); **d)** Accelerometer-derived sedentary behaviour per day (Ac-SB/day); mean=9.1 hours/day (SD=1.9).

C.3 Paper: Physical activity preferences, motivators, barriers and attitudes of adults with mental illness.

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Abstract

Background: Adults with mental illness may have specific attitudes toward physical activity (PA).

Aims: To assess the PA attitudes of non-institutionalised adults with mental illness, and associations with psychological distress.

Method: Participants completed questionnaires on activity preferences (type, context, and sources of support), motivators, barriers, and attitudes toward personal training (PT). Relationships between responses and distress were assessed using logistic regressions.

Results: 142 participants completed the questionnaires. PA context preferences included activities done close to home, outdoors, with professional instruction, with people of the same ability, as part of a healthy lifestyle program, and with a social component. The most commonly endorsed source of support was an exercise instructor. Most respondents had never received PT; however, PT had high acceptability. Common barriers included poor physical and mental health, and lack of money. Distress was positively associated with barriers of poor mental health, tiredness, disorganisation, exhaustion, and being shy/embarrassed ($p \leq .001$).

Conclusions: Local outdoor walking groups that include social and healthy lifestyle components, and that are led by an exercise instructor who can provide support for overcoming barriers, may best meet PA interests of this group. PT could be an acceptable method for offering individualised support.

Introduction

Adults with mental illnesses have a lower life expectancy than the general population (Chesney et al., 2014; Walker et al., 2015), and increased risk of chronic disease (De Hert et al., 2011; Morgan et al., 2011; Stubbs et al., 2015). Physical activity (PA) can protect against, and help manage, these outcomes (Blair et al., 1999; Lee et al., 2001; Leitzmann et al., 2007), enhance mental health and well-being (Alexandratos et al., 2012; Kim et al., 2012), and reduce symptoms of depression and anxiety (Rethorst et al., 2009; Wipfli et al., 2008). Despite the potential for PA to positively influence health and wellbeing, studies indicate that adults with mental illness have low levels of PA (Soundy et al., 2013). More work is needed, therefore, to develop appealing PA interventions for this group. Adults with mental illness may have specific attitudes toward PA which could influence adoption, adherence, and maintenance of an active lifestyle. Although previous research has investigated correlates of PA (Vancampfort et al., 2013; Vancampfort et al., 2012), which can be used to identify potential mechanisms of change, understanding the PA preferences and attitudes of adults with mental illness may inform the style and delivery of intervention planning for this group.

Adults with mental illness generally enjoy PA, believe in its benefits, and have a desire to be more active (Ussher et al., 2007). When included as a part of mental health treatment, patients regard PA as a valuable therapeutic component, and express a desire to continue exercising (Crone, 2007). Perceived benefits of PA include improved sleep, feelings of accomplishment, relaxation and lower stress levels, higher energy levels, improved self-confidence and self-esteem, and daily structure (Crone et al., 2008; J. McDevitt et al., 2006; Roberts et al., 2013; Tetlie et al., 2009). Commonly reported motivators include weight management, social interaction, and the potential to improve energy levels (Crone et al., 2008; Roberts et al., 2013), and commonly reported barriers include medication side effects (e.g. sedation, weight gain), mental illness symptoms, and low self-confidence, self-efficacy, and motivation (Buhagiar et al., 2011; Roberts et al., 2011; Searle et al., 2011). Those who participate in exercise programs identify a socially inclusive environment (Carless et al., 2008, 2012), low cost with transport provided (Carless et al., 2008), incorporating a “buddy” system (Roberts et al., 2011; Tetlie et al., 2009), sessions in small groups with a friendly instructor (Judith McDevitt et al., 2005;

Roberts et al., 2013), and tailoring to individual preferences and ability (Fogarty et al., 2005; J. McDevitt et al., 2006), as enablers to participation. Many of the studies with adults with mental illness have had small sample sizes (n<34) and focused on patients with a specific diagnosis (e.g. depression, schizophrenia).

Few studies have investigated detailed PA context preferences among adults with mental illness. A UK survey study found that equal numbers of respondents preferred individual and group activities (Ussher et al., 2007), but other context preferences (e.g. outdoors, done with people of the same sex etc.) were not examined (Ussher et al., 2007). A population-based study indicated that psychologically distressed individuals were more likely than those without distress to prefer supervised activities, activities done with people of the same sex, and activities done at a fixed time with scheduled sessions (Khan et al., 2012). However, this study used a measure of non-specific distress, and did not specifically target adults with mental illness.

Few studies have investigated attitudes of adults with mental illness toward specific sources of support. A UK survey study reported that most respondents agreed that they would exercise more if they could talk with an exercise instructor, or be advised by their doctor, but thought they would receive little help from family or friends (Ussher et al., 2007). We are not aware of studies that have investigated personal training (PT) as a specific source of support. Qualitative studies have found that participants identify acknowledgement of progress, monitoring of attendance, humour, and providing esteem support in the form of verbal encouragement and reinforcement (Gross et al., 2015), as effective exercise facilitator styles (J. McDevitt et al., 2006; Roberts et al., 2013; Tetlie et al., 2009). A survey of physical therapists also identified the importance of esteem support from health professionals and promoting enjoyment and autonomy (Soundy, Stubbs, et al., 2014).

The aim of this study was to assess the PA preferences (type, context, and sources of support), motivators and barriers, and attitudes toward PT, of adults with mental illness. To inform the development of PA interventions in those with high distress, a secondary aim was to assess the relationship between distress and PA context preferences, sources of support, and barriers. It was hypothesised that adults with mental illness experiencing higher psychological distress would have qualitatively different PA attitudes and opinions, to those with lower distress.

Method

Design

This was a cross-sectional study. Ethical approval was obtained from The University of Queensland Behavioural and Social Sciences Ethical Review Committee (2012000908), and the Royal Brisbane & Women's Hospital Human Ethical Review Committee (HREC/12/QRBW/286).

Recruitment

Individuals were approached in hospital waiting rooms of five psychiatric outpatient clinics, and at support groups of four community-based mental health organisations in Brisbane, Australia, and verbally invited by the researcher (JC) to participate. People in visible distress or with severe intellectual impairment were not invited to participate. Eligible participants were non-institutionalised men and women who self-identified as recovering from mental illness, were ambulatory, able to understand English, and over 18 years of age.

Procedure

Participants completed self-administered questionnaires about PA preferences (type, context, and sources of support), motivators, and barriers, and attitudes toward PT. Participants could ask questions, and the researcher provided verbal assistance with item comprehension. The researcher checked each questionnaire for completeness, and encouraged responses for missing data. Participants could complete the questionnaire immediately or take it home; verbal agreement and returning the completed questionnaire was regarded as consent. Participants received an AUD$5 gratuity for completing the questionnaire.

The questionnaire was piloted with five participants. Based on participant feedback, aspects of the design and wording of the survey were altered for clarity; these participants' data were not included in the analysis. Data were collected between October 2012 and December 2013.

Measures

Unless otherwise stated, questionnaire responses were on a 5-point Likert scale (*strongly disagree*, *disagree*, *neither agree nor disagree*, *agree*, and *strongly agree*).

Preferences for activity type (e.g., walking, swimming) were assessed using 23 items, as shown in the online supplement table. Preferences for activity context were assessed using 18 items (shown in Table 2), that were adapted from a previously used questionnaire (Khan et al.). The preferred time of day for activity was assessed using six items: before 8am, 8-11am, 11am-2pm, 2-5pm, 5-8pm. Sources of support were assessed using seven items (shown in Table 2): “I would be more active if: i) my doctor said that I should, ii) a psychologist or counsellor said that I should, iii) a support worker came with me, iv) an exercise instructor guided me through each exercise session, and v) an exercise instructor told me how to exercise”. Attitudes towards personal training (PT), and preferred PT context, were assessed using seven items each, as shown in Table 3.

PA barriers were assessed using 25 items, as shown in Table 4, including 19 items from a previously published questionnaire (Burton et al., 2007). PA motivators (e.g. to get fitter, to have more energy) were assessed using 16 items (shown in the online supplement table); participants rated each motivator on a 5-point Likert scale (*not at all important*, *not really important*, *neutral*, *a little important*, and *very important*). .

Questionnaires were used to obtain demographic information, and participants' self-reported psychiatric diagnosis from a defined list: depression, anxiety, psychoses, substance use, eating disorder, bipolar, or other (specified). Psychological distress was assessed using the Kessler-6 scale; scores range from 6 to 30 (Kessler et al., 2002).

Analyses

Participant responses were collapsed onto a 3-point scale (*strongly disagree/disagree, neither agree nor disagree,* and *strongly agree/agree*) for descriptive statistics, and items endorsed by at least 50% of participants were identified. To ascertain associations between psychological distress (K6 scores), and

PA sources of support, context preferences and barriers, binary logistic regressions were conducted on participant responses dichotomised into *preferred* (*strongly agree* and *agree*) or *not preferred* (*strongly disagree*, *disagree*, and *neither agree nor disagree*), adjusting for age and sex.

Outliers with studentized residuals over 2.5 were removed; correlations between dependent variables were all <0.31; linearity between continuous variables and the logit of the dependent variable were confirmed using the Bonferroni-corrected Box-Tidwell procedure ($\alpha > 0.05/2 > 0.025$). The regression model was applied to questionnaire items for which there were less than 10 outliers (i.e. analytical sample ≥ 132), and the number of *prefer* and *not prefer* responses was each more than 30 (i.e. case-sample ≥ 31). The regression model was applied to 36 questionnaire items (14 context preferences, 5 sources of support, and 17 barriers); significance was Bonferroni corrected ($\alpha < 0.05/36 < 0.001$). SPSS v.22 (SPSS Inc, Chicago, Illinois) was used to generate summary statistics and perform statistical tests.

Results

Of the 425 individuals invited to the study, 183 (43%) consented to the study, 78% of whom completed the questionnaire (n=142); no information is available on those who declined. Of those who completed the questionnaire, 55% (n=78) were recruited from hospital outpatient clinics. Participant demographic and health characteristics are summarised in Table 1.

Preferences (type, context, sources of support)

Preferences for PA type are presented in the online supplement table. Walking was the most preferred activity type (83%); other leading preferences included bushwalking (66%), strength training (60%), swimming (54%), and cycling (51%). Preferences for PA context and sources of support are presented in Table 2. Most respondents preferred activities that are done close to home, at home, outdoors, with people at their level of ability, with someone they know, with regular scheduled sessions, with professional instruction, with a social aspect, or as part of a healthy lifestyle program. Psychological distress was not significantly associated with any of the PA context preferences ($p > 0.02$). Similar proportions of respondents preferred exercise in the early morning (22%), mid-morning (21%), afternoon (22%) or evening (20%).

The most commonly endorsed source of support was an exercise instructor, with more than two-thirds of participants agreeing they'd be more active if *guided* through each exercise session, or if they were *told* how to exercise, by an exercise instructor. Fewer participants agreed they'd be more active if *told* to be by a doctor (GP), or a psychologist or counsellor, or if *accompanied* by a support worker. Psychological distress was positively associated with the preference to be guided through each exercise session by an exercise instructor (β=.203, p<.001).

Attitudes toward personal training (PT)

Attitudes toward personal trainers, and preferred PT context, are presented in Table 3. Most respondents (75%) reported never having received PT; however, most thought that PT improves motivation, and makes exercise fun. Most respondents also thought that personal trainers are friendly, and that "anyone" can have a personal trainer; however, the financial cost of PT was a barrier. If given the opportunity to receive PT, most would prefer *one-on-one* sessions in a community gym (e.g. PCYC, YMCA) or park, or *group* sessions in a park.

Barriers and motivators

PA barriers are presented in Table 4. The majority *disagreed* that lack of enjoyment of PA, the mental health service takes up too much time, work demands, social demands, fear of getting injured, lack of time, and age, were barriers. The most commonly cited PA barriers were poor physical and mental health, and lack of money. There was a positive association between psychological distress and barriers of: poor mental health (β=.194, p<.001), being too tired (β=.229, p<.001), exercise causing exhaustion (β=.232, p<.001), being too shy or embarrassed (β=.122, p=.001), and being unable to get organised (β=.114, p=.001).

PA motivators are presented in the online supplement table. The most commonly endorsed motivators were to improve mental health, and to get stronger/fitter. Motivators considered important by at least 80% of respondents included: to have more energy, to get out of the house, to cope with life stresses better, and to improve posture.

Discussion

Understanding the PA preferences (type, context, and sources of support), motivators and barriers of adults with mental illness can guide the development of interventions for this group. The most preferred activity type was walking, which is similar to general population studies (Booth et al., 1997), and has been shown to be beneficial for adults with mental illness (Soundy, Muhamed, et al., 2014). Commonly endorsed activity context preferences, such as exercise done close to home, and in the outdoors, and programs that are not just about exercise, are consistent with previous research with adults with psychosocial distress (Khan et al., 2012). Walking groups in the local neighbourhood that include regular social outings and health information sessions could accommodate these preferences. Respondents also preferred to do exercise with people at their level of ability, and with someone they know. This could reflect a desire to avoid situations where negative comparisons about ability can be made, and the desire for social support. The importance of social support for engaging this group in exercise has also been identified by clinicians in previous research (Soundy, Freeman, et al., 2014). Group-based exercise could be made more acceptable by allowing participants to choose exercises suitable to their ability, allocating participants to exercise groups according to fitness level, and by allowing participants to bring a friend or family member. These program characteristics may be important for people exhibiting weight gain (e.g. due to psychotropic medication) due to changes in body image (Tham et al., 2007). Psychological distress was not associated with PA context preferences.

Common barriers included poor physical and mental health, and lack of money. Several barriers were related to psychological distress, including being too tired, shy or embarrassed, unable to get organised, and exercise causing exhaustion; these identified barriers are consistent with previous research (Carpiniello et al., 2013). Sedation is a commonly reported symptom of some psychiatric medications (Seale et al., 2007), which may increase feelings of tiredness or exhaustion in response to exercise for people with high distress. Being too shy or embarrassed may be due to low self-confidence and self-esteem in this group (Bloom et al., 2011; Whiteford et al., 2013). Highly distressed participants may face greater barriers to PA, or that they are less able to problem solve such barriers; exercise counselling could be an effective means to facilitate PA adoption in this group (Richards et al., 2013).

An exercise instructor was the most commonly endorsed source of support, and there was a positive association between distress and the preference to be guided through each exercise session by an exercise instructor, potentially indicating that more highly distressed participants require more focused exercise support. Personal training (PT) had a high degree of acceptability: most participants thought that personal trainers were friendly, made exercise fun, and increased motivation. Other research indicates that programs for adults with mental illness should utilise exercise instructors who can provide good humour, a non-judgemental environment, encouragement, and professional instruction (J. McDevitt et al., 2006; Roberts et al., 2013; Tetlie et al., 2009). Most respondents preferred PT in a park or community gym, indicating a general aversion to the commercial gym setting. The implementation of PT programs for adults with mental illness would require upskilling of the exercise professionals, to improve their sensitivity to patient concerns (Rosenbaum et al., 2015), and to support appropriate referral to a clinician should mental health complexities arise during the program.

Results also indicated that professionals such as doctors and mental health staff could be a potential source of support to promote PA. Doctors and mental health staff could e.g., provide advice on PA benefits, encourage participation in PA programs, and where possible, accompany them to exercise sessions and assisting with transport. Interestingly, distress was not associated with the preference for support from medical professionals, potentially indicating that non-clinical exercise support is preferred.

Adults with mental illness have a diverse range of individual circumstances, and because PA preferences, motivators and barriers may change over time (e.g. due to changes in illness progression/recovery, employment, relationships, life events etc.) (Ingledew et al., 1998), broadly targeted, one-size-fits-all interventions may be difficult to justify (Prochaska et al., 1997). PA interventions designed according to the majority preference may be appealing to a high proportion of the target group; however, when trying to increase PA engagement of a marginalised and disadvantaged group, such as adults with mental illness, an individualised approach may be most effective (Seefeldt et al., 2002).

Strengths of this study include a community-based sample of adults across a range of mental illnesses. Previous studies had smaller sample sizes (n<34) and focused on patients with a specific diagnosis, which limits generalisability. This study extends other research by providing a more detailed assessment of motivators, preferences for activity type and context, and sources of support. It is the first study to assess attitudes toward personal training.

Limitations include a convenience sample which may not be representative. Self-reported psychiatric diagnosis may be subject to reporting errors; however, this data was only used to describe the sample and was not part of inferential analyses. Similarly, specific medications were not assessed as this was considered less relevant to the study aims. As in all survey studies, it is unknown if all participants understood the questions and interpreted them in the same way, which may be particularly relevant to adults with mental illness due to impairment of memory (Hickie et al., 2005; Jeste et al., 1996), and cognition (Austin et al., 2001; Elvevag et al., 2000; Green, 2006). However, the questions did not require behavioural recall (e.g. as in PA questionnaires), and participants had the opportunity to ask questions and receive assistance with comprehension. Our sample may be subject to volunteer bias; for example, people with higher PA levels, or interest in PA opportunities may have been more likely to participate; similarly, people with greater severity of symptoms or cognitive impairment may have been more likely to decline. Given that we recruited from mental health organisations, only people who were receiving support for their mental health were recruited, which may exclude people who have not presented with severe enough symptoms to warrant treatment, or who have not chosen to seek help. We also acknowledge that preferences and attitudes may not necessarily reflect actual behaviour. Our sample was not statistically powered to investigate other covariates (diagnosis, socioeconomic status etc.).

Conclusions

Low cost, neighbourhood outdoor walking or personal training programs, that include optional social and healthy lifestyle components, and that are led by an exercise instructor who can provide assistance with motivation and overcoming physical and mental health barriers experienced by adults with mental illness, may best be able to accommodate the physical activity preferences of this group. People with high levels of distress may require additional support to manage barriers of poor mental health. Given the diverse range of PA attitudes identified however, exercise interventions may need to be designed with flexibility for individual attitudes and circumstances.

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Table 1

Participant characteristics (N=142)

	Mean	**SD**
Age in years; mean (SD)	39.9	11.5
Distress [b]	15.0	5.8
	N	**%**
Female	61	43
Diagnosis		
Depression	13	9
Anxiety	5	4
Depression/anxiety	14	10
Psychoses	46	32
Psychoses *and* depression/anxiety	18	13
Bipolar	10	7
Other [a]	36	25
Living situation		
Single living alone	62	43
Couple, with/without children	21	15
Family members	23	16
Group of unrelated adults	13	9
Other	23	16
Income management		
Impossible/Always difficult	40	28
Sometimes difficult	54	38
Not bad/Easy	47	33
Education		
<Year 12	53	37
Year 12	27	19
Certificate/diploma	40	28
University	22	16
Employment		
Full-time/part-time	17	12
Volunteer	13	9
Student	14	10
Homemaker/retired	10	7
Unable to work	59	42
Unemployed/looking for work	29	20
Physical health		
Poor/fair	94	66
Good	36	25

Very good/excellent	12	8
Smoker status		
Daily/occasionally	84	60
Never/ex-smoker	57	40

[a] *Other* includes participants who reported multiple diagnoses e.g. two participants reported depression, anxiety, eating disorder, and substance use, etc.

[b] Distress was assessed using the Kessler-6 scale; scores range from 6 to 30, with scores over 15 indicating high distress(Kessler et al., 2002).

Table 2

Preferences for activity context and sources of support

Outcome	**Disagree**	**Neutral**	**Agree**	**Regression statistics** [a]	
	%	%	%	β	*p*
Preferred context					
Can be done close to home [b]	4	12	84	-	-
Are part of a healthy lifestyle program [b]	6	18	76	-	-
Involve regular, scheduled sessions	13	17	70	-0.028	0.404
Are done with people at my level of ability	9	23	68	0.018	0.581
Are done with someone I know	4	27	69	0.029	0.4
I can do on my own	16	18	67	-0.016	0.622
Include a social aspect (e.g. going out for coffee afterwards)	11	21	68	-0.044	0.191
Are done outdoors	9	33	59	-0.041	0.192
Involve professional instruction	16	26	57	-0.019	0.539
Are done at home	22	23	55	-0.026	0.418
Are done with people around my age	7	44	49	0.022	0.472
Have a set routine every session	18	35	47	0.054	0.089
Are done from a facility (e.g. sports centre or gym)	26	30	45	0.012	0.512
Are team based	22	40	39	-0.013	0.69
Are vigorous	32	34	35	-0.025	0.447
Are done with people of my own sex [b]	19	48	33	-	-
Are done with people recovering from mental illness	20	51	29	0.02	0.543
Involve competition [b]	44	32	23	-	-
Preferred sources of support					
Exercise instructor *guided* me through each exercise session	13	17	71	0.203	<.001*
Exercise instructor *told me how* to exercise	16	22	62	0.049	0.142
Doctor (GP) told me to	19	23	58	0.049	0.131
Support worker *came* with me	22	26	53	0.052	0.103
Psychologist or counsellor told me to	20	29	51	0.074	0.03

Table 3

Attitudes toward personal training

Outcome	**Disagree** %	**Neutral** %	**Agree** %
Attitudes toward personal trainers [a]			
Improves motivation for exercise	8	15	77
Too expensive	6	18	75
Makes exercise fun	11	25	64
Anyone can have a personal trainer	19	26	56
Not suitable if I have an injury	32	33	35
Only for fit people	45	31	24
Personal trainers aren't friendly	54	30	16
Preferred personal training context [b]			
Group sessions in the *park*	26	15	59
One-on-one sessions in a *community gym* (e.g. PCYC, YMCA)	22	22	56
One-on-one sessions in the *park*	25	19	56
Group sessions in a *community gym* (e.g. PCYC, YMCA)	27	23	50
One-on-one sessions in a *commercial gym*	30	24	47
One-on-one sessions in *my own home*	35	19	46
Group sessions in a *commercial gym*	35	22	43

[a] Participants responded to: "What do you think about personal training?"

[b] Participants responded to: "If you were to see a personal trainer, which of the following would you prefer:"

Table 4

Physical activity barriers

Outcome	**Disagree**	**Neutral**	**Agree**	**Regression statistics** [a]	
	%	%	%	*β*	*p*
Poor physical health	26	16	58	0.111	0.002
Lack of money	28	18	54	0.086	0.011
Poor mental health	27	23	51	0.194	.001*
I can't get motivated	32	21	47	0.085	0.014
I don't like the gym "scene"	32	26	42	0.095	0.006
Problems with transport	36	23	42	0.064	0.046
I'm too shy or embarrassed	34	28	39	0.122	.001*
I can't get organised	37	23	39	0.114	.001*
My weight	43	19	38	-0.002	0.955
I'm too tired	37	25	37	0.229	<.001*
Medication side-effects	41	21	38	0.084	0.016
I have an injury	49	14	37	0.075	0.025
I don't have the right clothes/shoes	44	23	32	0.093	0.011
I'm not sure what to do	44	25	31	0.058	0.084
Facilities are too far away	36	33	31	0.07	0.039
Exercise makes me too exhausted	46	25	29	0.232	<.001*
Lack of skill [b]	50	27	23	-	-
My age	53	25	22	0.039	0.291
Social demands [b]	52	27	21	-	-
I'm afraid of getting injured [b]	59	20	21	-	-
Lack of time [b]	56	24	20	-	-
I do not enjoy physical activity [b]	66	20	14	-	-
The mental health service takes up too much of my time [b]	64	22	14	-	-
Work demands [b]	62	25	13	-	-
Lack of access to childcare [b]	70	25	5	-	-

[a] Logistic regression analysis performed on questionnaire responses categorised into *not preferred* (*disagree* and *neutral* responses) and *preferred* (*agree* responses); statistics refer to the psychological distress covariate, adjusted for age and sex.

[b] Items *not* assessed in the logistic regression model, due to case-sample ≤ 30, or number of outliers ≥ 10.

Table 5 (Online supplement)

Preferred activity type, and physical activity motivators

Outcome	Disagree %	Neutral %	Agree %
Preferred activity type			
Walking in the neighbourhood	7	10	83
Bushwalking	17	17	66
Weights / strength training	23	17	60
Swimming	27	19	54
Cycling outdoors	34	15	51
Dancing	34	18	49
TaiChi	29	22	49
Tennis	31	20	50
Martial arts	34	18	48
Yoga	32	22	47
Boxing for fitness	35	18	47
Walking on a treadmill	38	22	40
Volleyball	32	27	41
Cycling in a gym	36	25	39
Pilates	36	28	36
Soccer	37	31	32
Aerobics	40	24	36
Jogging outdoors	43	19	38
Cricket	42	30	28
Touch football	45	25	30
Basketball	46	26	28
Jogging on a treadmill	49	21	30
Netball	52	24	24
Motivators			
To improve my mental health	4	6	90
To get stronger and fitter	2	8	90
To get out of the house	4	9	87
To have more energy	2	11	87
To cope with life stresses better	6	9	85
To improve my posture	7	12	81
To relax	10	11	79
To balance other things I do (e.g. smoking, overeating)	10	10	80

To *prevent* sickness and illness	9	13	78
To lose weight	12	11	77
To improve how I look	14	11	75
To help me sleep	10	16	74
To make new friends	15	15	70
To *recover* from illness/injury	13	19	68
To spend time with others (family, friends, partner)	12	22	66
To counteract the side-effects of medications	18	21	60

APPENDIX D: Cross-sectional study materials

D.1 School of Human Movement and Nutrition Sciences Ethics

THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

School of Human Movement Studies
HEAD OF SCHOOL
Professor Doune Macdonald

The University of Queensland
Brisbane Qld 4072 Australia
Telephone (07) 3365 6241
International +61 7 3365 6241
Facsimile (07) 3365 6877
Email secretary@hms.uq.edu.au
Internet www.hms.uq.edu.au
CRICOS PROVIDER NUMBER 00025B

February 19, 2013

Ms Sarah Guthrie
School of Human Movement Studies,
Connell Building
The University of Queensland
St Lucia QLD 4072

Dear Ms Guthrie

Re: ethical review of the following project:

Physical activity preferences, attitudes and patterns in adults with mental illness in an inpatient psychiatric hospital.

Thank you for the opportunity to review your revised proposal. I am pleased to let you know that your revisions have been cleared in accordance with the ethical review guidelines at The University of Queensland. Your approval number is: HMS12/0913.R1.

Please note that:

(i) Amendments to any part of the approved protocol (however minor) should be submitted to me for consideration.
(ii) Signed statements of informed consent should be kept secure in case we need to access them in the future.

I wish you well with your research.

Yours sincerely,

Timothy J. Carroll
School of Human Movement Studies Ethics Committee

D.2 The University of Queensland Institutional Human Research Ethics Approval

THE UNIVERSITY OF QUEENSLAND

Institutional Human Research Ethics Approval

Project Title:	Physical Activity Preferences, Attitudes And Patterns In Adults With Mental Illness In An Inpatient Psychiatric Hospital
Chief Investigator:	Ms Sarah Fraser
Supervisor:	Dr Nicola Burton, Prof Harvey Whiteford, Prof Wendy Brown
Co-Investigator(s):	Justin Chapman
School(s):	Human Movement Studies
Approval Number:	2014000420
Granting Agency/Degree:	PhD
Duration:	30th April 2015

Comments/Conditions:

Note: if this approval is for amendments to an already approved protocol for which a UQ Clinical Trials Protection/Insurance Form was originally submitted, then the researchers must directly notify the UQ Insurance Office of any changes to that Form and Participant Information Sheets & Consent Forms as a result of the amendments, before action.

Name of responsible Committee:
Medical Research Ethics Committee
This project complies with the provisions contained in the *National Statement on Ethical Conduct in Human Research* and complies with the regulations governing experimentation on humans.

Name of Ethics Committee representative:
Professor Bill Vicenzino
Chairperson
Medical Research Ethics Committee

Signature ________ Date 2 May 2014

D.3 Information sheet

THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

tph Toowong Private Hospital

PARTICIPANT INFORMATION SHEET

Activity patterns of adults with mental illness at a private psychiatric hospital

---

What is this study about?

You are invited to help us learn more about the physical activity levels, attitudes and preferences of adults with mental illness during an admission to a psychiatric hospital. This information can then be used to guide the development of strategies to promote healthy lifestyles and provide improved physical activity opportunities in the hospital setting.

What is involved?

If you agree to participate in this study, the research nurse will ask you to:

1. **Complete a survey** about your preferences and barriers for physical activity. The survey will also ask you questions about your general health and emotional wellbeing and some general descriptive questions about you, e.g. age, education, marital status. The survey will take approximately 30 minutes to complete. The research nurse will collect the survey from you within **3** days.

And if you consent:

2. **Wear an activity monitor** for 7 consecutive days. An activity monitor is a small device worn on a belt on your hip that records your daily activity patterns. The activity monitor can be worn over or under your clothing. It is not waterproof and must be taken off for bathing and swimming.

3. **Keep an activity diary** for 7 consecutive days. The activity diary is to be completed in conjunction with wearing the activity monitor. We will ask you to keep a record of the times you put on and take off the activity monitor each day. We will also ask you some short questions in relation to your activity each day.

If you consent to this study, the research nurse will also access your inpatient file to obtain information regarding your height, weight, blood pressure, diagnosis and current prescribed medication.

Are there any risks or benefits?

There are no risks associated with this study. As a participant, no specific behavior changes are involved.

If interested, you are welcome to a summary of the results at the completion of the study. By participating in this study, you will be helping us to develop strategies to promote healthy lifestyles and provide improved physical activity opportunities in the hospital setting.

Ethics Information

All the information you provide will be anonymous, confidential and locked in secure storage or as password protected electronic documents. Participants will not be identified in any reports.

Your participation in this study is voluntary and you may withdraw from the study at any time without prejudice. Withdrawing from the study will have no impact on future health care you receive.

The coordinator and primary researcher for this study is: Sarah Guthrie (Toowong Private Hospital; The University of Queensland School of Human Movement Studies). Other researchers involved in this study are: Professor Harvey Whiteford (Toowong Private Hospital; The University of Queensland School of Population Health), Dr Nicola Burton and Professor Wendy Brown (The University of Queensland School of Human Movement Studies).

Questions?

If you have any questions regarding this study, please contact Sarah Guthrie on 07 3721 8019 or by email, sarah.guthrie@uq.net.au. Alternatively, you may see Sarah in person by asking your allocated nurse to contact her.

This study has been cleared in accordance with the ethical review guidelines and processes of the University of Queensland. These guidelines are endorsed by the University's principal human ethics committee, the Human Experimentation Ethical Review Committee, and registered with the Australian Health Ethics Committee as complying with the National Statement. You are free to discuss your participation in this study with project staff (Sarah Guthrie, telephone: 07 3721 8019). If you would like to speak to an officer of the University not involved in the study, you may contact the School of Human Movement Studies Ethics Officer on 3365 6380.

D.4 Consent form

THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

tph Toowong Private Hospital

PARTICIPANT CONSENT FORM

Activity patterns of adults with mental illness at a private psychiatric hospital

- I have read and understood the information sheet for this study. I have had the opportunity to discuss the study and ask questions with the researcher. I am satisfied with the answers regarding my participation.

- I understand that taking part in this study is voluntary and that I may withdraw from the study at any time without prejudice. Withdrawing from the study will have no impact on future health care I receive.

- I understand that my participation in this study is confidential and that no identifiable factors will be included in any published reports.

- I understand that all collected data will be stored within the hospital grounds or as password protected electronic documents.

- I understand that my inpatient file will be accessed and information related to my height, weight, blood pressure, diagnosis and current prescribed medication will be obtained.

I ____ (full name) hereby consent to

take part in this study by (please tick one or both boxes):

☐ completing the survey
☐ wearing an activity monitor and keeping a diary for seven days

Signature: _______________________ Date: _______________________

This study has been cleared in accordance with the ethical review guidelines and processes of the University of Queensland. These guidelines are endorsed by the University's principal human ethics committee, the Human Experimentation Ethical Review Committee, and registered with the Australian Health Ethics Committee as complying with the National Statement. You are free to discuss your participation in this study with project staff (Sarah Guthrie, telephone: 07 3721 8019). If you would like to speak to an officer of the University not involved in the study, you may contact the School of Human Movement Studies Ethics Officer on 3365 6380.

D.5 Survey

THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

Participant Number _________

PHYSICAL ACIVITY PATTERNS OF ADULTS WITH MENTAL ILLNESS AT A PRIVATE PSYCHIATRIC HOSPITAL

Survey Book

     

tph Toowong Private Hospital

Thank you for helping with this study

By completing this survey you will help the researcher to learn more about the activity patterns, attitudes and preferences of adults with mental illness during an admission to a psychiatric hospital. This information can then be used to guide the development of strategies to promote healthy lifestyles and provide improved physical activity opportunities for patients in the hospital setting.

Instructions

★ Please read each question carefully and answer as accurately as you can.

★ If you are unsure how to answer, mark the response for the closest answer to what you think.

★ There are no right or wrong answers

Most of the questions can be answered by either ticking a box or circling a number on a line. For example:

*In general would you say your **physical** health is:*

☐ **Poor** ☐ **Fair** ☑ **Good** ☐ **Very good** ☐ **Excellent**

Physical activity can be beneficial for:

	Strongly disagree	Disagree	Unsure	Agree	Strongly agree
Improving my fitness	1	2	③	4	5

Some questions will ask you to write your response like this:

How much do you weigh?

80kg

★ Your answers are **completely confidential**

★ No one will see your answers except the researchers. Your name will not be on the survey

★ The nurse researcher will collect this survey from you within **3 days**

If you have any further questions on how to answer this survey, please ask your nurse to contact Sarah Guthrie

The following questions are about your attitudes to physical activity

1. **To what extent do you agree or disagree with the following statements about doing physical activity as an inpatient in hospital? *(Please circle one number on each line)*.**

I prefer to do physical activities that:

		Strongly disagree	Disagree	Unsure	Agree	Strongly agree
a.	I can do on my own	1	2	3	4	5
b.	Are done with people around my age	1	2	3	4	5
c.	Are done outdoors	1	2	3	4	5
d.	Require skill and practice	1	2	3	4	5
e.	Have a set routine and format	1	2	3	4	5
f.	Are done at a fixed time (e.g. scheduled sessions)	1	2	3	4	5
g.	Involve supervision (e.g. from a leader)	1	2	3	4	5
h.	Are done with people of my own sex	1	2	3	4	5
i.	Are done with 1 to 2 others	1	2	3	4	5
j.	Are done with a small group (3-10 others)	1	2	3	4	5
k.	Are done with people at my level of ability	1	2	3	4	5
l.	Are done in hospital	1	2	3	4	5
m.	Are done out of hospital	1	2	3	4	5
n.	Are done with other people with mental illness	1	2	3	4	5

2. What types of physical activity would you prefer to do while you are in hospital? *(Please <u>tick</u> the boxes that apply to you)*

- 1 ☐ Walking
- 2 ☐ Running
- 3 ☐ Pilates
- 4 ☐ Yoga
- 5 ☐ Gardening
- 6 ☐ Swimming
- 7 ☐ Cycling
- 8 ☐ Gym
- 9 ☐ Aerobics
- 10 ☐ Tai Chi
- 11 ☐ None
- 12 ☐ Team sports ______________________________ *(please write)*
- 13 ☐ Racquet sports ______________________________ *(please write)*
- 14 ☐ Other ______________________________ *(please write)*

3. Whom would you prefer to give physical activity <u>recommendations or advice</u> to adults with mental illness in hospital? *(Please <u>tick</u> one box only)*

- 1 ☐ Personal trainer
- 2 ☐ Gym instructor
- 3 ☐ General Nurse
- 4 ☐ Mental Health Nurse
- 5 ☐ Doctor
- 6 ☐ Exercise Physiologist
- 7 ☐ Physiotherapist
- 8 ☐ Other ____________________

4. Whom would you prefer to <u>design</u> a physical activity program for adults with mental illness in hospital? *(Please <u>tick</u> one box only)*

- 1 ☐ Personal trainer
- 2 ☐ Gym instructor
- 3 ☐ General Nurse
- 4 ☐ Mental Health Nurse
- 5 ☐ Doctor
- 6 ☐ Exercise Physiologist
- 7 ☐ Physiotherapist
- 8 ☐ Other ____________________

5. Whom would you prefer to <u>lead</u> a physical activity program for adults with mental illness in hospital? *(Please <u>tick</u> one box only)*

- 1 ☐ Personal trainer
- 2 ☐ Gym instructor
- 3 ☐ General Nurse
- 4 ☐ Mental Health Nurse
- 5 ☐ Doctor
- 6 ☐ Exercise Physiologist
- 7 ☐ Physiotherapist
- 8 ☐ Other ____________________

6. **When would you prefer to do physical activity as an inpatient in hospital? *(Please circle one number on each line)***

		Strongly disagree	Disagree	Unsure	Agree	Strongly agree
a.	Between 5.00am and 7.00am	1	2	3	4	5
b.	Between 7.00am and 9.00am	1	2	3	4	5
c.	Between 9.00am and 12.00pm	1	2	3	4	5
d.	Between 1.00pm and 5.00pm	1	2	3	4	5
e.	Between 5.00pm and 8.00pm	1	2	3	4	5
f.	Between 8.00pm and 11.00pm	1	2	3	4	5

7. **To what extent do you agree or disagree with the following statements (Please circle one number on each line)**

Personally, I might be interested in doing physical activity as an inpatient in hospital

		Strongly disagree	Disagree	Unsure	Agree	Strongly agree
a.	To give me space to think	1	2	3	4	5
b.	To control my weight	1	2	3	4	5
c.	To maintain good health	1	2	3	4	5
d.	To help improve my emotional wellbeing	1	2	3	4	5
e.	To help manage my stress	1	2	3	4	5
f.	To improve my energy levels	1	2	3	4	5
g.	Because I enjoy exercising	1	2	3	4	5
h.	To improve my appearance	1	2	3	4	5
i.	Because I enjoy the social aspects of exercising	1	2	3	4	5
j.	To give me a sense of achievement	1	2	3	4	5
k.	To build up my strength	1	2	3	4	5
l.	To help my flexibility	1	2	3	4	5
m.	Because my doctor advised me to	1	2	3	4	5
n.	To help my physical ability to do everyday tasks	1	2	3	4	5
o.	To help manage my pain	1	2	3	4	5
p.	To help me sleep better	1	2	3	4	5

8. **How interested are you in doing physical activity as an inpatient? *(Please __circle__ one number)***

Not interested 1 2 3 4 5 6 7 8 9 10 **Very interested**

9. **To what extent do you agree or disagree with the following statements about what would make it __difficult__ for you do to physical activity as an inpatient in hospital**

(Please __circle__ one number on each line) about what might make it difficult for you to do physical activity as an inpatient in hospital

		Strongly disagree	Disagree	Unsure	Agree	Strongly agree
a.	Do not have enough time	1	2	3	4	5
b.	Feel too tired	1	2	3	4	5
c.	Physical health problems	1	2	3	4	5
d.	Feel unwell	1	2	3	4	5
e.	Lack of energy	1	2	3	4	5
f.	Lack of motivation	1	2	3	4	5
g.	Do not enjoy physical activity	1	2	3	4	5
h.	Lack of access to facilities	1	2	3	4	5
i.	Financial cost	1	2	3	4	5
j.	Too shy or embarrassed	1	2	3	4	5
k.	Not the sporty type	1	2	3	4	5
l.	Do not have the right clothes	1	2	3	4	5
m.	Worried that I might get injured	1	2	3	4	5
n.	I am too old	1	2	3	4	5
o.	Bad weather: too hot/cold/raining	1	2	3	4	5
p.	Feel unsafe to go outside	1	2	3	4	5

Are there any other reasons why it would be difficult for you to do physical activity as an inpatient in hospital?

____

____

____________________________________*(please write)*

10. How much support/encouragement from <u>family</u> would you receive if you wanted to do physical activity while in hospital? *(Please <u>tick</u> one box only)*

1☐ Don't know
2☐ None
3☐ Very little
4☐ Some
5☐ Lots

11. How much support/encouragement from <u>friends</u> would you receive if you wanted to do physical activity while in hospital?*(Please <u>tick</u> one box only)*

1☐ Don't know
2☐ None
3☐ Very little
4☐ Some
5☐ Lots

12. As an inpatient at Toowong Private Hospital, did you participate in any of the following activities during the <u>LAST WEEK</u>? *(Please <u>tick</u> the boxes that apply to you)*

a. ☐ Morning walks

How often: 1☐ None 2☐ Once 3☐ 2-3 4☐ 4-5 5☐ 6-7

b. ☐ Gym sessions

How often: 1☐ None 2☐ Once 3☐ 2-3 4☐ 4-5 5☐ 6-7 6☐ 7 +

The next questions are about any other physical activity that you may have done in the last week.

These questions need an estimate of the time (hours, minutes) or number of times you engaged in certain activities. For example:

Number of times		Total time			Number of times
	AND	Hours	Minutes	**If none, just write zero:**	
2		*2*	*30*		*0*

13. In the LAST WEEK, how many times have you walked continuously, for at least 10 minutes to <u>get to or from places</u>?

Number of times

14. What do you estimate was the total time that you spent walking in this way in the LAST WEEK?

Total time	
Hours	Minutes

15. In the LAST WEEK, how many times have you walked continuously, for at least 10 minutes for <u>recreation or exercise</u>?

Number of times

16. What do you estimate was the total time that you spent walking in this way in the LAST WEEK?

Total time	
Hours	Minutes

17. In the LAST WEEK, how many times did you do any vigorous gardening or heavy work around the yard, which made you breathe harder or puff and pant?

Number of times

18. **What do you estimate was the total time that you spend doing vigorous gardening or heavy work around the yard in the last week?**

Total time	
Hours	Minutes

The next questions exclude household chores, gardening or yard work:

19. **In the LAST WEEK, how many times did you do any vigorous physical activity which made you breathe harder or puff and pant? (e.g. jogging, cycling)**

Number of times

20. **What do you estimate was the total time that you spent doing this vigorous physical activity in the LAST WEEK?**

Total time	
Hours	Minutes

21. **In the LAST WEEK, how many times did you do any other more moderate physical activities that you have not already mentioned? (e.g. gentle swimming, social tennis, golf, yoga, pilates)**

Number of times

22. **What do you estimate was the total time that you spent doing these activities in the LAST WEEK?**

Total time	
Hours	Minutes

23. In the LAST WEEK, can you name the physical activities have you participated in?

____

____

____

____*(please write)*

24. How easy or hard was it to estimate the time spent doing physical activity LAST WEEK *(please circle one number)*

Easy 1 2 3 4 5 6 7 8 9 10 **Hard**

25. In the LAST WEEK, please estimate how much time you spent sitting each day in the following situations: (please WRITE you answer). If not applicable write 0.

		On a **WEEK** day		On a **WEEKEND** day	
		Hours	Minutes	Hours	Minutes
a.	While traveling to and from places				
c.	While watching television				
d.	While using a computer				
e.	In Stream A, e.g. groups				
f.	In Stream B, e.g. craft				
g.	Time with your Doctor, Nurse, Psychologist, Social Worker or Occupational Therapist				
h.	Time spent smoking				
i.	General relaxing (sitting or lying), e.g. reading, needle work (not watching t.v or using a computer)				
j.	Time spent doing work, e.g. homework, assignments, reading documents, writing NOT using a computer.				
k.	Time spent doing nothing (either lying down or sitting)				

26. How easy or hard was it to estimate time spent sitting last week *(please circle one number)*

Easy 1 2 3 4 5 6 7 8 9 10 **Hard**

27. To what extent do you agree or disagree with the following statements *(please circle one number on each line)*.

Physical activity can be beneficial for:

		Strongly disagree	Disagree	Unsure	Agree	Strongly agree
a.	Managing heart disease	1	2	3	4	5
b.	Managing diabetes	1	2	3	4	5
c.	Managing arthritis and musculoskeletal health	1	2	3	4	5
d.	Managing asthma	1	2	3	4	5
e.	Managing chronic pain	1	2	3	4	5
f.	Quality of life	1	2	3	4	5
g.	Resilience	1	2	3	4	5
h.	Psychological wellbeing	1	2	3	4	5
i.	Life balance	1	2	3	4	5
j.	Coping	1	2	3	4	5
k.	Managing stress	1	2	3	4	5
l.	Managing depression	1	2	3	4	5
m.	Managing anxiety	1	2	3	4	5
n.	Managing alcohol and drug disorders	1	2	3	4	5
o.	Managing chronic fatigue syndrome	1	2	3	4	5
p.	Managing schizophrenia	1	2	3	4	5
q.	Managing bipolar disorder	1	2	3	4	5
r.	Managing post traumatic stress disorder	1	2	3	4	5

About you

Please read each question carefully and answer as accurately as you can.

1 How old are you?

______________________ *(please write)*

2 What is your gender?

1 ☐ Male

2 ☐ Female

3 What is your country of birth?

1 ☐ Australia

2 ☐ Other _____________________ *(please write)*

4 Is English the language you speak at home?

1 ☐ Yes

2 ☐ No _______________*(please write your language you speak at home)*

5 Which of the following best describes your living situation?

1 ☐ Single and living alone

2 ☐ Single and living with others

3 ☐ Single and living with children

4 ☐ Couple (married or de-facto) without children

5 ☐ Couple (married or de-facto) living with children

6 If you have dependent children, please answer the following:

☐ Not applicable

How many children are in your care? __________

How many children are aged younger than 5 years? _________

How many children are aged between 6 and 14 years? _______

How many children are older than 15 years? _________

7 **Which of the following describes your employment situation prior to being admitted to hospital?**

1 ☐ Not working – looking for employment

2 ☐ Not working – full time house keeping

3 ☐ Not working – retired

4 ☐ Not working – studying

5 ☐ Pensioner on benefits (other than old age) e.g. Disability Support Pension or Sickness Allowance?

6 ☐ Working without pay

7 ☐ Paid part time/casual work

8 ☐ Full time paid employment

8 **How do you manage on the income you have available?**

1 ☐ It is impossible

2 ☐ It is difficult all the time

3 ☐ It is difficult some of the time

4 ☐ It is not too bad

5 ☐ It is easy

9 **What is your highest completed level of education?**

1 ☐ School only

2 ☐ Trade certificate/apprenticeship

3 ☐ Diploma

4 ☐ Bachelor Degree

5 ☐ Post-graduate Degree (e.g. Masters, PhD)

10 **In general, in the last FOUR weeks would you say your PHYSICAL health has been:**

1 ☐ Poor

2 ☐ Fair

3 ☐ Good

4 ☐ Very Good

5 ☐ Excellent

11 **In general, in the last FOUR weeks would you say your MENTAL health has been:**

1 ☐ Poor
2 ☐ Fair
3 ☐ Good
4 ☐ Very Good
5 ☐ Excellent

12 **In the last FOUR WEEKS, to what extent did physical injuries or physical health concerns restrict your ability to be physically active?**

1 ☐ All of the time
2 ☐ Most of the time
3 ☐ Some of the time
4 ☐ A little of the time
5 ☐ None of the time

If you answered either little, some, most or all of the time, please **write** down your current physical injuries and how they restrict your ability to be physically active:

____

____

____

____*(Please write)*

13 **In the last FOUR WEEKS, to what extent did your mental health restrict your ability to be physically active?**

1 ☐ All of the time
2 ☐ Most of the time
3 ☐ Some of the time
4 ☐ A little of the time
5 ☐ None of the time

If you answered either little, some, most or all of the time, please **write** how your mental health restricts your ability to be physically active:

____

____

____*(Please write)*

14 **What medications you are currently prescribed?**

____

____

____*(please write)*

15 **To what extent do you experience side effects from your medications?**

1 ☐ All of the time
2 ☐ Most of the time
3 ☐ Some of the time
4 ☐ A little of the time
5 ☐ None of the time

What side effects are you experiencing?

____

____

____*(please write)*

16 **During the last FOUR WEEKS, how often did you feel** *(Please **circle** one number for each line)*

		None of the time	A little of the time	Some of the time	Most of the time	All of the time
a.	Nervous?	1	2	3	4	5
b.	Hopeless?	1	2	3	4	5
c.	Restless or fidgety?	1	2	3	4	5
d.	Everything was an effort?	1	2	3	4	5
e.	So sad that nothing could cheer you up?	1	2	3	4	5
f.	Worthless?	1	2	3	4	5

17 **What is your main reason for being in hospital?**

____

____*(please write)*

The nurse researcher will collect this survey from you within **5 days**.

If the decision is made for you to be **discharged before** the completion of this 5 day period, please hand the survey into your allocated nurse prior to discharge.

THANK YOU FOR THE TIME AND EFFORT YOU PUT INTO COMPLETING THIS SURVEY

D.6 Activity diary

Participant number: ____________

Activity Diary

     

Start Date: ________________________

What is this study about?

★ This study is about the activity patterns of adults with mental illness in an inpatient psychiatric hospital.

What does the study require you to do?

★ The study requires participants to wear an activity monitor (a small device that you wear on your hip to measure movement) and to complete this diary for **7 consecutive days**. To complete this study, you do not have to change any of your normal behaviours or day-to-day activities.

Your answers in this diary are **completely confidential**. No one will see your answers except the researchers. Your name will not be on this diary.

Instructions

1. Please start wearing the activity monitor **immediately** after you receive it from the research nurse. Start using the diary the next day.

2. Please wear the activity monitor **during the day and night**, even if you have a sleep or a rest during the day.

3. The activity monitor is not waterproof. Please **take it off** in water, e.g. showering, bathing.

4. Please wear the activity monitor for **7 consecutive days**.

5. Please keep the diary for the **7 consecutive days**

6. At the **end** of the 7 consecutive days, please complete the questionnaire at the back of the diary. The research nurse will then collect the diary and activity monitor from you.

If the decision is made for you to be **discharged before** the completion of the seven-day study period, please hand both the activity monitor and booklet into your allocated nurse prior to discharge.

HOW TO WEAR THE ACTIVITY MONITOR

- The activity monitor can be worn either above or below clothing. It is not necessary for the activity monitor to make contact with your skin. However, the activity monitor must fit snugly against your body to collect the best data. We suggest wearing it over an undergarment so it does not itch.
- The elastic belt runs through the back of the activity monitor and the belt should be against your body/clothing (as per picture below).
- Place the activity monitor and attached belt on or around your hips so the activity monitor sits on your **right** hip.
- Please keep the placement of the activity monitor consistent over the seven days.

The Physical Activity Diary

1. Please record the times that you did not wear the activity monitor by ticking the **not worn** box as shown in the example below.
2. Please also record the times in which you did some **physical activity** that was **longer than 10 minutes** in duration.
3. Please record the time you went to bed each night and the time you woke up each morning.

4. Please write beside each box the reason you were not wearing the activity monitor, i.e. shower, bath or the type of physical activity you were doing.

5. Please complete the questions at the bottom of each page related to your sitting time and other activities you participated in during the day.

***Please note**: If at any time you do not want to write your activity details due to personal reasons, leave the description section blank (please still tick the boxes and write the times).*

If you have any questions on how to complete this diary, please ask your nurse to contact Sarah Guthrie

Example of how to complete the diary:

Remember to record and give a description for:
★ The length of time you did not wear the activity monitor
★ The length of time you did some physical activity

Date: 12.05.2013
Day of week:
Monday Tuesday Wednesday Thursday Friday Saturday Sunday

What time did you go to bed last night? 10.00pm

What time did you wake up this morning? 7.30am

Did you wear the activity monitor to bed last night? ☑ Yes ☐ No

If **No**: What time did you take the activity monitor off? ___________

What time did you put the activity monitor back on? ___________

Time	Information	Description
08.15 am **to** 09.00am	☐ NOT WORN ☑ PHYSICAL ACTIVITY	Went on the morning walking group
09.00 am **to** 09.30am	☑ NOT WORN ☐ PHYSICAL ACTIVITY	Showering
2.00 pm **to** 2.30 pm	☐ NOT WORN ☑ PHYSICAL ACTIVITY	Attended the gym – bike

Date:

Day of week:

1 Monday 2 Tuesday 3 Wednesday 4 Thursday 5 Friday 6 Saturday 7 Sunday

Remember to record and give a description for:

★ The length of time you did not wear the activity monitor
★ The length of time you did some physical activity

What time did you go to bed last night? _________________

What time did you get up this morning? _________________

Did you wear the activity monitor to bed last night? ☐ Yes ☐ No

If **No**: What time did you take the activity monitor off? ___________

What time did you put the activity monitor back on? ___________

Time	Information	Description
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	

1. Please estimate how much time you spend **sitting today** in the following situations: (please write you answer). If not applicable write **0**.

		Hours	Minutes
a.	While traveling to and from places		
c.	While watching television		
d.	While using a computer		
e.	In Stream A, e.g. groups		
f.	In Stream B, e.g. craft		
g.	Time with your Doctor, Nurse, Psychologist, Social Worker or Occupational Therapist		
h.	Time spent smoking		
i.	General relaxing (sitting or lying), e.g. reading, needle work (not watching t.v or computer)		
j.	Time spent doing work, e.g. homework, assignments, reading documents, writing NOT using a computer		
k.	Time spent doing nothing (either lying down or sitting)		

2. Did you have day leave today?

☐ Yes ____________________ (please write length of time)

☐ No

If Yes, can you please give a description of what you did, i.e. walked around the shopping mall; spent time at home with family

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____(Please write)

Date:

Day of week:

1 Monday 2 Tuesday 3 Wednesday 4 Thursday 5 Friday 6 Saturday 7 Sunday

Remember to record and give a description for:

★ The length of time you did not wear the activity monitor

★ The length of time you did some physical activity

What time did you go to bed last night? ________________

What time did you get up this morning? ________________

Did you wear the activity monitor to bed last night? ☐ Yes ☐ No

If **No**: What time did you take the activity monitor off? __________

What time did you put the activity monitor back on? __________

Time	Information	Description
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	

1. Please estimate how much time you spend **sitting today** in the following situations: (please write you answer). If not applicable write **0**.

		Hours	Minutes
a.	While traveling to and from places		
c.	While watching television		
d.	While using a computer		
e.	In Stream A, e.g. groups		
f.	In Stream B, e.g. craft		
g.	Time with your Doctor, Nurse, Psychologist, Social Worker or Occupational Therapist		
h.	Time spent smoking		
i.	General relaxing (sitting or lying), e.g. reading, needle work (not watching t.v or computer)		
j.	Time spent doing work, e.g. homework, assignments, reading documents, writing NOT using a computer		
k.	Time spent doing nothing (either lying down or sitting)		

2. Did you have day leave today?

☐ Yes ____________________ (please write length of time)

☐ No

If Yes, can you please give a description of what you did, i.e. walked around the shopping mall; spent time at home with family

____

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____(Please write)

Date:

Day of week:

1 Monday 2 Tuesday 3 Wednesday 4 Thursday 5 Friday 6 Saturday 7 Sunday

Remember to record and give a description for:

★ The length of time you did not wear the activity monitor

★ The length of time you did some physical activity

What time did you go to bed last night? _________________

What time did you get up this morning? _________________

Did you wear the activity monitor to bed last night? ☐ Yes ☐ No

If **No**: What time did you take the activity monitor off? ___________

What time did you put the activity monitor back on? ___________

Time	Information	Description
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	

1. Please estimate how much time you spend **sitting today** in the following situations: (please write you answer). If not applicable write **0**.

		Hours	Minutes
a.	While traveling to and from places		
c.	While watching television		
d.	While using a computer		
e.	In Stream A, e.g. groups		
f.	In Stream B, e.g. craft		
g.	Time with your Doctor, Nurse, Psychologist, Social Worker or Occupational Therapist		
h.	Time spent smoking		
i.	General relaxing (sitting or lying), e.g. reading, needle work (not watching t.v or computer)		
j.	Time spent doing work, e.g. homework, assignments, reading documents, writing NOT using a computer		
k.	Time spent doing nothing (either lying down or sitting)		

2. Did you have day leave today?

☐ Yes ____________________ (please write length of time)

☐ No

If Yes, can you please give a description of what you did, i.e. walked around the shopping mall; spent time at home with family

____

____

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____

____

____(Please write)

Date:

Day of week:

1 Monday 2 Tuesday 3 Wednesday 4 Thursday 5 Friday 6 Saturday 7 Sunday

Remember to record and give a description for:

★ The length of time you did not wear the activity monitor

★ The length of time you did some physical activity

What time did you go to bed last night? _________________

What time did you get up this morning? _________________

Did you wear the activity monitor to bed last night? ☐ Yes ☐ No

If **No**: What time did you take the activity monitor off? ___________

What time did you put the activity monitor back on? ___________

Time	**Information**	**Description**
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	

1. Please estimate how much time you spend **sitting today** in the following situations: (please write you answer). If not applicable write **0**.

		Hours	Minutes
a.	While traveling to and from places		
c.	While watching television		
d.	While using a computer		
e.	In Stream A, e.g. groups		
f.	In Stream B, e.g. craft		
g.	Time with your Doctor, Nurse, Psychologist, Social Worker or Occupational Therapist		
h.	Time spent smoking		
i.	General relaxing (sitting or lying), e.g. reading, needle work (not watching t.v or computer)		
j.	Time spent doing work, e.g. homework, assignments, reading documents, writing NOT using a computer		
k.	Time spent doing nothing (either lying down or sitting)		

2. Did you have day leave today?

☐ Yes ____________________ (please write length of time)

☐ No

If Yes, can you please give a description of what you did, i.e. walked around the shopping mall; spent time at home with family

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____(Please write)

Date:

Day of week:

1 Monday 2 Tuesday 3 Wednesday 4 Thursday 5 Friday 6 Saturday 7 Sunday

Remember to record and give a description for:

★ The length of time you did not wear the activity monitor

★ The length of time you did some physical activity

What time did you go to bed last night? _________________

What time did you get up this morning? _________________

Did you wear the activity monitor to bed last night? ☐ Yes ☐ No

If **No**: What time did you take the activity monitor off? ___________

What time did you put the activity monitor back on? ___________

Time	Information	Description
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	

1. Please estimate how much time you spend **sitting today** in the following situations: (please write you answer). If not applicable write **0**.

		Hours	Minutes
a.	While traveling to and from places		
c.	While watching television		
d.	While using a computer		
e.	In Stream A, e.g. groups		
f.	In Stream B, e.g. craft		
g.	Time with your Doctor, Nurse, Psychologist, Social Worker or Occupational Therapist		
h.	Time spent smoking		
i.	General relaxing (sitting or lying), e.g. reading, needle work (not watching t.v or computer)		
j.	Time spent doing work, e.g. homework, assignments, reading documents, writing NOT using a computer		
k.	Time spent doing nothing (either lying down or sitting)		

2. Did you have day leave today?

☐ Yes ____________________ (please write length of time)

☐ No

If Yes, can you please give a description of what you did, i.e. walked around the shopping mall; spent time at home with family

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____(Please write)

Date:

Day of week:

1 Monday 2 Tuesday 3 Wednesday 4 Thursday 5 Friday 6 Saturday 7 Sunday

Remember to record and give a description for:

★ The length of time you did not wear the activity monitor

★ The length of time you did some physical activity

What time did you go to bed last night? _________________

What time did you get up this morning? _________________

Did you wear the activity monitor to bed last night? ☐ Yes ☐ No

If **No**: What time did you take the activity monitor off? ___________

What time did you put the activity monitor back on? ___________

Time	Information	Description
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	

3 Please estimate how much time you spend **sitting today** in the following situations: (please write you answer). If not applicable write **0**.

		Hours	Minutes
a.	While traveling to and from places		
c.	While watching television		
d.	While using a computer		
e.	In Stream A, e.g. groups		
f.	In Stream B, e.g. craft		
g.	Time with your Doctor, Nurse, Psychologist, Social Worker or Occupational Therapist		
h.	Time spent smoking		
i.	General relaxing (sitting or lying), e.g. reading, needle work (not watching t.v or computer)		
j.	Time spent doing work, e.g. homework, assignments, reading documents, writing NOT using a computer		
k.	Time spent doing nothing (either lying down or sitting)		

4 Did you have day leave today?

☐ Yes ____________________ (please write length of time)

☐ No

If Yes, can you please give a description of what you did, i.e. walked around the shopping mall; spent time at home with family

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____(Please write)

Date:

Day of week:

1 Monday 2 Tuesday 3 Wednesday 4 Thursday 5 Friday 6 Saturday 7 Sunday

Remember to record and give a description for:

★ The length of time you did not wear the activity monitor

★ The length of time you did some physical activity

What time did you go to bed last night? _________________

What time did you get up this morning? _________________

Did you wear the activity monitor to bed last night? ☐ Yes ☐ No

If **No**: What time did you take the activity monitor off? ___________

What time did you put the activity monitor back on? ___________

Time	**Information**	**Description**
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	

1. Please estimate how much time you spend **sitting today** in the following situations: (please write you answer). If not applicable write **0**.

		Hours	Minutes
a.	While traveling to and from places		
c.	While watching television		
d.	While using a computer		
e.	In Stream A, e.g. groups		
f.	In Stream B, e.g. craft		
g.	Time with your Doctor, Nurse, Psychologist, Social Worker or Occupational Therapist		
h.	Time spent smoking		
i.	General relaxing (sitting or lying), e.g. reading, needle work (not watching t.v or computer)		
j.	Time spent doing work, e.g. homework, assignments, reading documents, writing NOT using a computer		
k.	Time spent doing nothing (either lying down or sitting)		

2. Did you have day leave today?

☐ Yes ____________________ (please write length of time)

☐ No

If Yes, can you please give a description of what you did, i.e. walked around the shopping mall; spent time at home with family

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____(Please write)

Please complete the following questions before handing this diary and the activity monitor back to the nurse researcher.

*For the next **five** questions please **circle** a number from 1 – 10, with 1 being the easiest and 10 being the most difficult.*

1 Overall how easy or difficult was it to complete the physical activity diary?

Easy 1 2 3 4 5 6 7 8 9 10 **Difficult**

Please comment

____

____

____

2 How easy or difficult was it to wear the activity monitor during waking hours?

Easy 1 2 3 4 5 6 7 8 9 10 **Difficult**

Please comment

____

____

____

3 How easy or difficult was it to wear the activity monitor when asleep?

Easy 1 2 3 4 5 6 7 8 9 10 **Difficult**

Please comment

____

____

____

4 How easy or difficult was it to record the time you took off and put on the activity monitor?

Easy 1 2 3 4 5 6 7 8 9 10 **Difficult**

Please comment

____

____

____

5 How easy or difficult was it to record <u>the time (if)</u> you did (any) physical activity?

Easy	1	2	3	4	5	6	7	8	9	10	**Difficult**

Please comment

____

____

____

6 How easy or difficult was it to record <u>the type</u> (if) you did (any) physical activity?

Easy	1	2	3	4	5	6	7	8	9	10	**Difficult**

Please comment

____

____

____

7 How easy or difficult was it to record your sitting time each day?

Easy	1	2	3	4	5	6	7	8	9	10	**Difficult**

Please comment

____

____

____

8 Do you have any other comments you would like to make regarding this study?

Please comment

____

____

____

____

Thank you for taking the time to complete this diary
The nurse researcher will collect the diary and activity monitor from you within the next 24 hours

APPENDIX E: Metabolic health counselling study materials

E.1 The University of Queensland Institutional Human Research Ethics Approval (Original)

THE UNIVERSITY OF QUEENSLAND

Institutional Human Research Ethics Approval

Project Title:	Evaluation Of The Effectiveness Of A Physical Activity Counselling Program For Adults With Mental Illness At A Private Psychiatric Hospital Outpatient Clinic
Chief Investigator:	Ms Sarah Fraser
Supervisor:	Dr Nicola Burton, Prof Harvey Whiteford, Prof Wendy Brown
Co-Investigator(s):	None
School(s):	Human Movement Studies
Approval Number:	2014000483
Granting Agency/Degree:	PhD
Duration:	31st December 2015

Comments/Conditions:

Note: If this approval is for amendments to an already approved protocol for which a UQ Clinical Trials Protection/Insurance Form was originally submitted, then the researchers must directly notify the UQ Insurance Office of any changes to that Form and Participant Information Sheets & Consent Forms as a result of the amendments, before action.

Name of responsible Committee:
Behavioural & Social Sciences Ethical Review Committee
This project complies with the provisions contained in the *National Statement on Ethical Conduct in Human Research* and complies with the regulations governing experimentation on humans.

Name of Ethics Committee representative:
Associate Professor John McLean
Chairperson
Behavioural & Social Sciences Ethical Review Committee

Signature ____________ Date 1/5/2014

E.2 The University of Queensland Institutional Human Research Ethics Approval (Amendment)

THE UNIVERSITY OF QUEENSLAND

Institutional Human Research Ethics Approval

Project Title:	Evaluation Of The Effectiveness Of A Physical Activity Counselling Program For Adults With Mental Illness At A Private Psychiatric Hospital Outpatient Clinic - 05/02/2015 - AMENDMENT
Chief Investigator:	Ms Sarah Fraser
Supervisor:	Dr Nicola Burton, Prof Harvey Whiteford, Prof Wendy Brown
Co-Investigator(s):	None
School(s):	Human Movement Studies
Approval Number:	2014000483
Granting Agency/Degree:	PhD
Duration:	31st December 2015

Comments/Conditions:

Note: if this approval is for amendments to an already approved protocol for which a UQ Clinical Trials Protection/Insurance Form was originally submitted, then the researchers must directly notify the UQ Insurance Office of any changes to that Form and Participant Information Sheets & Consent Forms as a result of the amendments, before action.

Name of responsible Committee:
Behavioural & Social Sciences Ethical Review Committee
This project complies with the provisions contained in the *National Statement on Ethical Conduct in Human Research* and complies with the regulations governing experimentation on humans.

Name of Ethics Committee representative:
Associate Professor John McLean
Chairperson
Behavioural & Social Sciences Ethical Review Committee

Signature ____________ Date 11/2/2015

E.3 Information sheet (Original)

THE UNIVERSITY OF QUEENSLAND AUSTRALIA

tph Toowong Private Hospital

PARTICIPANT INFORMATION SHEET

Physical activity counselling for adults with mental illness

What is this study about?

You are invited to help us assess the effectiveness of a physical activity counselling program at Toowong Private Hospital. This program is offered to help improve your physical health and emotional wellbeing, and can help manage the weight gain side effects from some mental health medications. The information from this study can then be used to improve the program.

What is involved?

If you agree to participate in this study, the research nurse will ask you to:

1 **Attend an initial assessment appointment** (approximately 1½ hours) during which you will:

   a. See a doctor who will assess your physical health and activity history and conduct a physical examination.
   b. Be asked to get a fasting blood test done outside of the clinic the following week. This will be repeated at the end of the program.
   c. See the research nurse who will measure your blood pressure, pulse, weight, height, and waist and hip circumference and complete an electrocardiogram.

   The doctor will discuss the results of this assessment at your next appointment (week 1), which will take approximately 1 hour.

2 **Attend physical activity counselling sessions with the nurse**. These sessions will take place every three weeks (weeks 1, 4, 7, 10, 13, 16 and 19) and will take approximately ½ hour. During these appointments you will also have your weight measured.

3 **Attend a medical review** every six weeks (weeks 7, 13 and 19) with a doctor and the research nurse who will measure your blood pressure and waist circumference, review your progress and give brief lifestyle advice. These appointments will take approximately ½ hour.

4 **Wear an activity monitor and complete an activity diary** for 7 consecutive days at three time points during the program in weeks 1, 9 and 18. An activity monitor is a small device worn on a belt on your hip that records your movement patterns. On return of the activity monitor, you will receive a $15 gift card.

5 **Wear a pedometer and complete a step log** for 7 consecutive days prior to your appointment in weeks 1, 7, 13 and 19. A pedometer is a small device worn on your hip that records your daily number of steps.

6 **Complete a survey** at the start and end of the program which will ask about your physical activity, general health, emotional wellbeing and some general descriptions, e.g. age, education, marital status.

All appointments will take place at Toowong Private Hospital. After the final appointment for this study, you are welcome to continue attending the program. Your results will continue to be logged, however they will not be used as part of the analysis for this study.

Are there any risks or benefits?

By participating in this study, you access a program that provides free health assessment and free physical activity counselling and advice. You will receive a free pedometer to use during the program that is yours to keep and a $15 gift card on return of the activity monitor in weeks 1, 9 and 19. You will also be helping us to improve the physical activity counselling program.

There are no risks associated with this study. You may experience some minor temporary discomfort with some of the procedures (e.g. blood test), or as you start being more active. If interested, you are welcome to a written summary of the program evaluation at the completion of the study.

Ethics Information

All the information you provide will be anonymous, confidential and locked in secure storage or as password protected electronic documents. Participants will not be identified in any reports. Your participation in this study is voluntary and you may withdraw from the study at any time without prejudice. Withdrawing from the study will have no impact on future health care you receive.

The coordinator and primary researcher for this study is: Sarah Fraser (Toowong Private Hospital; The University of Queensland School of Human Movement Studies). Other researchers involved in this study are: Professor Harvey Whiteford (Toowong Private Hospital; The University of Queensland School of Population Health), Dr Nicola Burton and Professor Wendy Brown (The University of Queensland School of Human Movement Studies).

Questions?

If you have any questions regarding this study, please contact Sarah Fraser on 3721 8019 (Monday & Wednesday); 3365 4998 (Tuesday, Thursday & Friday) or by email: s.guthrie@uq.edu.au.

E.4 Information sheet (Amended)

THE UNIVERSITY OF QUEENSLAND AUSTRALIA

tph Toowong Private Hospital

PARTICIPANT INFORMATION SHEET

Extension: Physical activity counselling for adults with mental illness

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What is this study extension about?

You have been participating in a physical activity-counselling program at Toowong Private Hospital. We are extending the duration of the program and are inviting you to participate.

What is involved?

1 **Attend two extra physical activity counselling sessions with the nurse**. These sessions will take place at two six week intervals (weeks 25 and 31) and will take approximately ½ hour. During these appointments you will continue to have your weight measured.

2 **Attend an extra medical review** at week 31 with a doctor and the research nurse who will measure your blood pressure and waist circumference, review your progress and give brief lifestyle advice. These appointments will take approximately ½ hour.

3. **Wear an activity monitor and complete an activity diary** for 7 consecutive days at week 31. On return of the activity monitor, you will receive a $15 gift card.

4. **Wear a pedometer and complete a step log** for 7 consecutive days prior to your appointment in week 31. The pedometer is the small device worn on your hip that records your daily number of steps.

5. **Complete another survey** at week 31 which will ask about your physical activity and further feedback regarding the program.

All appointments will take place at Toowong Private Hospital. After the assessment at week 31, you are welcome to continue attending the program. Your results will continue to be logged, however they will not be used as part of the analysis for this study.

Are there any risks or benefits?

By participating in this study extension, you will continue to access a program that provides free health assessment and free physical activity counselling and advice. You will receive another $15 gift card on return of the activity monitor after assessment in week 31. Your feedback will continue to help us to improve the physical activity counselling program. There are no additional risks associated with this study extension.

If you chose not to participate in the program extension, then your data from the 19 weeks of attending the program will be used and no further study assessment is required.

If interested, you are welcome to a written summary of the overall program evaluation at the completion of the study.

Ethics Information

All the information you provide will be anonymous, confidential and locked in secure storage or as password protected electronic documents. Participants will not be identified in any reports. Your participation in this study is voluntary and you may withdraw from the study at any time without prejudice. Withdrawing from the study will have no impact on future health care you receive.

The coordinator and primary researcher for this study is: Sarah Fraser (Toowong Private Hospital; The University of Queensland School of Human Movement and Nutrition Sciences). Other researchers involved in this study are: Professor Harvey Whiteford (Toowong Private Hospital; The University of Queensland School of Population Health), Dr Nicola Burton and Professor Wendy Brown (The University of Queensland School of Human Movement and Nutrition Sciences).

Questions?

If you have any questions regarding this study, please contact Sarah Fraser on 3721 8019 (Monday & Wednesday); 3365 4998 (Tuesday, Thursday & Friday) or by email: s.guthrie@uq.edu.au.

This study adheres to the Guidelines of the ethical review process of The University of Queensland and the National Statement on Ethical Conduct in Human Research. Whilst you are free to discuss your participation in this study with project staff (contactable on 07 3721 8019 Monday & Wednesday; 07 3365 4998 Tuesday, Thursday & Friday), if you would like to speak to an officer of the University not involved in the study, you may contact the Ethics Coordinator on 3365 3924

E.5 Consent form (Original)

THE UNIVERSITY OF QUEENSLAND AUSTRALIA

tph Toowong Private Hospital

PARTICIPANT CONSENT FORM

Physical activity counselling for adults with mental illness

- I have read and understood the information sheet for this study. I have had the opportunity to discuss the study and ask questions with the researcher. I am satisfied with the answers regarding my participation.
- I understand that taking part in this study is voluntary and that I may withdraw from the study at any time without prejudice. Withdrawing from the study will have no impact on future health care I receive.
- I understand that my participation in this study is confidential and that no identifiable factors will be included in any published reports.
- I understand that all collected data will be stored within the hospital grounds or as password protected electronic documents.

I ____ (full name) hereby consent to

take part in this study

Signature: _______________________ Date: _______________________

The coordinator and primary researcher for this study is: Sarah Fraser (Toowong Private Hospital; The University of Queensland School of Human Movement Studies). Other researchers involved in this study are: Professor Harvey Whiteford (Toowong Private Hospital; The University of Queensland School of Population Health), Dr Nicola Burton and Professor Wendy Brown (The University of Queensland School of Human Movement Studies).

This study adheres to the Guidelines of the ethical review process of The University of Queensland and the National Statement on Ethical Conduct in Human Research. Whilst you are free to discuss your participation in this study with project staff (contactable on 07 3721 8019 Monday & Wednesday; 07 3365 4998 Tuesday, Thursday & Friday), if you would like to speak to an officer of the University not involved in the study, you may contact the Ethics Coordinator on 3365 3924.

E.6 Consent form (Amended)

THE UNIVERSITY OF QUEENSLAND AUSTRALIA

tph Toowong Private Hospital

PARTICIPANT CONSENT FORM

Extension: Physical activity counselling for adults with mental illness

- I have read and understood the information sheet regarding the extension of this study. I have had the opportunity to discuss the study extension and ask questions with the researcher. I am satisfied with the answers regarding my participation.
- I understand that taking part in this study extension is voluntary and that I may withdraw from the study at any time without prejudice. Withdrawing from the study will have no impact on future health care I receive.
- I understand that my participation in this study extension is confidential and that no identifiable factors will be included in any published reports.
- I understand that all collected data will be stored within the hospital grounds or as password protected electronic documents.

I ____ (full name) hereby consent to

take part in this study extension

Signature: _______________________ Date: _______________________

The coordinator and primary researcher for this study is: Sarah Fraser (Toowong Private Hospital; The University of Queensland School of Human Movement and Nutrition Sciences). Other researchers involved in this study are: Professor Harvey Whiteford (Toowong Private Hospital; The University of Queensland School of Population Health), Dr Nicola Burton and Professor Wendy Brown (The University of Queensland School of Human Movement and Nutrition Sciences).

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E.7 Survey (Baseline with demographics questionnaire)

THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

Study ID ___________

PHYSICAL ACTIVITY COUNSELLING FOR ADULTS WITH MENTAL ILLNESS






Survey Booklet
Initial Assessment

tph Toowong Private Hospital

Thank you for helping with this study

You are invited to help us learn more about the effectiveness of a physical activity counselling program on improving the physical activity levels, physical health and wellbeing in adults with mental illness. The information from this study will be used to improve the physical activity counselling program.

Instructions

- ★ Please read each question carefully and answer as accurately as you can.
- ★ If you are unsure how to answer, mark the response for the closest answer to what you think.
- ★ There are no right or wrong answers

Most of the questions can be answered by either ticking a box or circling a number on a line. For example:

*In general, you would say that your **physical** health was:*

☐ **Poor** ☐ **Fair** ☑ **Good** ☐ **Very good** ☐ **Excellent**

Physical activity can be beneficial for:

	Strongly disagree	Disagree	Unsure	Agree	Strongly agree
Improving my fitness	1	2	③	4	5

Some questions will ask you to write your response like this:

How much do you weigh?

80kg

- ★ Your answers are **completely confidential**
- ★ No one will see your answers except the researchers. Your name will not be on the survey
- ★ The nurse researcher will collect this survey from you at your **next appointment**

If you have any further questions on how to answer this survey, please contact Sarah Fraser on 3721 8019 (Monday & Wednesday) or 3365 4998 (Tuesday, Thursday & Friday) or email: s.guthrie@uq.edu.au

These questions are about the physical activity that you may have done in the last week

These questions need an estimate of the time (hours, minutes) or number of times you engaged in certain activities. For example:

Number of times
2

AND

Total time	
Hours	Minutes
2	30

If none, just write zero:

Number of times
0

28. In the LAST WEEK, how many times have you walked continuously, for at least 10 minutes to <u>get to or from places</u>?

Number of times

29. What do you estimate was the total time that you spent walking in this way in the LAST WEEK?

Total time	
Hours	Minutes

30. In the LAST WEEK, how many times have you walked continuously, for at least 10 minutes for <u>recreation or exercise</u>?

Number of times

31. What do you estimate was the total time that you spent walking in this way in the LAST WEEK?

Total time	
Hours	Minutes

32. In the LAST WEEK, how many times did you do any vigorous gardening or heavy work around the yard, which made you breathe harder or puff and pant?

Number of times

33. What do you estimate was the total time that you spend doing vigorous gardening or heavy work around the yard in the last week?

Total time	
Hours	Minutes

The next questions exclude household chores, gardening or yard work:

34. In the LAST WEEK, how many times did you do any vigorous physical activity which made you breathe harder or puff and pant? (e.g. jogging, cycling)

Number of times

35. What do you estimate was the total time that you spent doing this vigorous physical activity in the LAST WEEK?

Total time	
Hours	Minutes

36. In the LAST WEEK, how many times did you do any other more moderate physical activities that you have not already mentioned? (e.g. gentle swimming, social tennis, golf, yoga, pilates)

Number of times

37. What do you estimate was the total time that you spent doing these activities in the LAST WEEK?

Total time	
Hours	Minutes

38. In the LAST WEEK, please name the physical activities have you participated in (e.g. tennis, walking, yoga)?

____

____

____

____*(please write)*

39. In the last week, please estimate how much time you spent sitting on **A TYPICAL DAY** in the following situations: (please WRITE you answer). If not applicable write 0.

		On a **WEEK** day		On a **WEEKEND** day	
		Hours	Minutes	Hours	Minutes
a.	While traveling to and from places				
b.	While at work				
c.	While watching television				
d.	While using a computer / smart phone / tablet (not at work)				
e.	In your leisure time, NOT including television (e.g. visiting friends, movies, dining out etc.)				

The following questions relate to your attitudes about physical activity

To what extent do you agree or disagree with the following statements about what would make it difficult for you do to physical activity. *(Please circle one number on each line)*

		Strongly disagree	Disagree	Unsure	Agree	Strongly agree
a.	Work demands	1	2	3	4	5
b.	Poor physical health	1	2	3	4	5
c.	Poor mental health	1	2	3	4	5
d.	I feel guilty because I should be doing something else	1	2	3	4	5
e.	I find it hard to get into a regular routine	1	2	3	4	5
f.	Do not enjoy physical activity	1	2	3	4	5
g.	Lack of energy	1	2	3	4	5
h.	Lack of motivation	1	2	3	4	5
i.	Doing things with my family	1	2	3	4	5
j.	Spending time with friends	1	2	3	4	5
k.	Lack of skill	1	2	3	4	5
l.	Lack of access to facilities	1	2	3	4	5
m.	Financial cost	1	2	3	4	5
n.	Problems with transport	1	2	3	4	5
o.	Not the sporty type	1	2	3	4	5
p.	Do not have the right clothes	1	2	3	4	5
q.	Worried that I might get injured	1	2	3	4	5
r.	Needing help with child care	1	2	3	4	5
s.	Not having done physical activity before	1	2	3	4	5
t.	My age	1	2	3	4	5
u.	My weight	1	2	3	4	5
v.	Feel too shy or embarrassed	1	2	3	4	5
w.	Feel unsafe to go outside	1	2	3	4	5
x.	Difficult for me to organise my activities each day	1	2	3	4	5

Are there any other reasons why it would be difficult for you to do physical activity?

____

____*(please write)*

To what extent do you agree or disagree with the following statements (Please <u>circle</u> one number on each line)

Personally, I might be interested in doing physical activity

		Strongly disagree	Disagree	Unsure	Agree	Strongly agree
a.	To give me space to think	1	2	3	4	5
b.	To manage my weight	1	2	3	4	5
c.	To maintain good physical health	1	2	3	4	5
d.	To help improve my emotional wellbeing	1	2	3	4	5
e.	To help manage my stress	1	2	3	4	5
f.	To improve my energy levels	1	2	3	4	5
g.	Because I enjoy exercising	1	2	3	4	5
h.	To improve my appearance	1	2	3	4	5
i.	Because I enjoy the social aspects of exercising	1	2	3	4	5
j.	To give me a sense of achievement	1	2	3	4	5
k.	To build up my strength	1	2	3	4	5
l.	To help my flexibility	1	2	3	4	5
m.	Because my doctor advised me to	1	2	3	4	5
n.	To help my physical ability to do everyday tasks	1	2	3	4	5
o.	To help manage my pain	1	2	3	4	5
p.	To help me cope better	1	2	3	4	5
q.	To help me sleep better	1	2	3	4	5
r.	To give me a sense of normality	1	2	3	4	5

Are there any other reasons why you might be interested in doing physical activity?

____

____

____

____

____

____*(please write)*

To what extent do you agree or disagree with the following statements *(please <u>circle</u> one number on each line)*.

Physical activity can be beneficial for:

		Strongly disagree	Disagree	Unsure	Agree	Strongly agree
a.	Managing heart disease	1	2	3	4	5
b.	Managing diabetes	1	2	3	4	5
c.	Managing arthritis and musculoskeletal health	1	2	3	4	5
d.	Managing asthma	1	2	3	4	5
e.	Managing chronic pain	1	2	3	4	5
f.	Quality of life	1	2	3	4	5
g.	Resilience	1	2	3	4	5
h.	Psychological wellbeing	1	2	3	4	5
i.	Life balance	1	2	3	4	5
j.	Coping	1	2	3	4	5
k.	Managing stress	1	2	3	4	5
l.	Managing depression	1	2	3	4	5
m.	Managing anxiety	1	2	3	4	5
n.	Managing alcohol and drug disorders	1	2	3	4	5
o.	Managing chronic fatigue syndrome	1	2	3	4	5
p.	Managing schizophrenia	1	2	3	4	5
q.	Managing bipolar disorder	1	2	3	4	5
r.	Managing post traumatic stress disorder	1	2	3	4	5

The following questions relate to your health and wellbeing

The following questions ask how you feel about your quality of life, health and other areas of your life. Please **CIRCLE** the answer that appears most appropriate.

We ask that you think about your life in the last **FOUR WEEKS**.

		Poor	Fair	Good	Very Good	Excellent
a.	In general would you say your **PHYSICAL** health is	1	2	3	4	5
b.	In general would you say your **MENTAL** health is	1	2	3	4	5
c.	How would you rate your quality of life?	1	2	3	4	5

		Very Dissatisfied	Dissatisfied	Neither satisfied or dissatisfied	Satisfied	Very satisfied
d.	How satisfied are you with your health?	1	2	3	4	5

The following questions ask about **how much** you have experienced certain things in the last **FOUR WEEKS**.

		Not at all	A little	A moderate amount	Very much	An extreme amount
e.	To what extent do you feel that physical pain prevents you from doing what you need to do?	1	2	3	4	5
f.	How much medical treatment do you need to function in your daily life?	1	2	3	4	5
g.	How much do you enjoy life?	1	2	3	4	5
h.	To what extent do you feel your life to be meaningful?	1	2	3	4	5
i.	How well are you able to concentrate	1	2	3	4	5
j.	How safe do you feel in your daily life?	1	2	3	4	5
k.	How healthy is your physical environment?	1	2	3	4	5

The following questions ask about **how completely** you experience or were able to do certain things in the last **FOUR WEEKS**.

		Not at all	A little	Moderately	Mostly	Completely
l.	Do you have enough energy for everyday life?	1	2	3	4	5
m.	Are you able to accept your bodily appearance?	1	2	3	4	5
n.	Have you enough money to meet your needs?	1	2	3	4	5
o.	How available to you is the information that you need in your day-to-day life?	1	2	3	4	5
p.	To what extent do you have the opportunity for leisure activities?	1	2	3	4	5
q.	How well are you able to get around	1	2	3	4	5

How satisfied are you with:

		Very dissatisfied	Dissatisfied	Neither satisfied or dissatisfied	Satisfied	Very Satisfied
r.	Your sleep?	1	2	3	4	5
s.	Your ability to perform your daily living activities?	1	2	3	4	5
t.	Your capacity to work?	1	2	3	4	5
u.	Yourself?	1	2	3	4	5
v.	Your personal relationships?	1	2	3	4	5
w.	Your sex life?	1	2	3	4	5
x.	The support you get from your friends?	1	2	3	4	5
y.	The conditions of your living place?	1	2	3	4	5
z.	Your access to health services?	1	2	3	4	5
aa	With your transport?	1	2	3	4	5

The following question refers to **how often** you have felt or experienced certain things in the last **FOUR WEEKS**.

		Never	Seldom	Quite often	Very often	Always
bb.	How often do you have negative feelings such as blue mood, despair, anxiety or depression?	1	2	3	4	5

Please read each statement and **circle** a number 0, 1, 2 or 3, which indicates how much the statement applied to you over the **PAST WEEK**. There are no right or wrong answers. Do not spend too much time on any statement.

		Did not apply	Sometimes	A good part of the time	Most of the time
a.	I found it hard to wind down	0	1	2	3
b.	I was aware of dryness of my mouth	0	1	2	3
c.	I couldn't seem to experience any positive feeling at all	0	1	2	3
d.	I experienced breathing difficulty (e.g. rapid breathing, breathlessness in the absence of physical exertion)	0	1	2	3
e.	I found it difficult to work up the initiative to do things	0	1	2	3
f.	I tended to over-react to situations	0	1	2	3
g.	I experienced trembling (e.g. in the hands)	0	1	2	3
h.	I felt that I was using a lot of nervous energy	0	1	2	3
i.	I was worried about situations in which I might panic and make a fool of myself	0	1	2	3
j.	I felt that I had nothing to look forward to	0	1	2	3
k.	I found myself getting agitated	0	1	2	3
l.	I found it difficult to relax	0	1	2	3
m.	I felt down-hearted and blue	0	1	2	3
n.	I was intolerant of anything that kept me from getting on with what I was doing	0	1	2	3
o.	I felt I was close to panic	0	1	2	3
p.	I was unable to become enthusiastic about anything	0	1	2	3
q.	I felt I wasn't worth much as a person	0	1	2	3
r.	I felt that I was rather touchy	0	1	2	3
s.	I was aware of the action of my heart in the absence of physical exertion (e.g. sense of increased heart rate, heart missing a beat)	0	1	2	3
t.	I felt scared without any good reason	0	1	2	3
u.	I felt that life was meaningless	0	1	2	3

About you

Please read each question carefully and answer as accurately as you can.

1 How old are you?

______________________ *(please write)*

2 What is your gender?

1 ☐ Male

2 ☐ Female

3 What is your country of birth?

1 ☐ Australia

2 ☐ Other ______________________ *(please write)*

4 Is English the language you speak at home?

1 ☐ Yes

2 ☐ No ______________________ *(please write your first language)*

5 Which of the following best describes your living situation?

1 ☐ Single and living alone

2 ☐ Single and living with others

3 ☐ Single and living with children

4 ☐ Couple (married or de-facto) without children

5 ☐ Couple (married or de-facto) living with children

6 If you have dependent children, please answer the following:

☐ Not applicable

How many children are in your care? __________

How many children are aged younger than 5 years? _________

How many children are aged between 6 and 14 years? _______

How many children are older than 15 years? _________

7 **Which of the following describes your employment situation prior to being admitted to hospital?**

1 ☐ Not working – looking for employment

2 ☐ Not working – full time house keeping

3 ☐ Not working – retired

4 ☐ Not working – studying

5 ☐ Pensioner on benefits (other than old age) e.g. Disability Support Pension or Sickness Allowance?

6 ☐ Working without pay

7 ☐ Paid part time/casual work

8 ☐ Full time paid employment

8 **How do you manage on the income you have available?**

1 ☐ It is impossible

2 ☐ It is difficult all the time

3 ☐ It is difficult some of the time

4 ☐ It is not too bad

5 ☐ It is easy

9 **What is your highest completed level of education?**

1 ☐ School only

2 ☐ Trade certificate/apprenticeship

3 ☐ Diploma

4 ☐ Bachelor Degree

5 ☐ Post-graduate Degree (e.g. Masters, PhD)

10 **Do you have access to a car for your personal use?**

1 ☐ Yes

2 ☐ No

3 ☐ Sometimes

11 **How often do you rely on public transport to get to and from places?**

1 ☐ None of the time

2 ☐ A little of the time

3 ☐ Some of the time

4 ☐ Most of the time

5 ☐ All of the time

12 In the last FOUR WEEKS, to what extent did physical injuries or physical health concerns restrict your ability to be physically active?

1 ☐ All of the time
2 ☐ Most of the time
3 ☐ Some of the time
4 ☐ A little of the time
5 ☐ None of the time

If you answered either little, some, most or all of the time, please **write** down your current physical injuries and how they restrict your ability to be physically active:

____

____

____

____*(Please write)*

13 In the last FOUR WEEKS, to what extent did your mental health restrict your ability to be physically active?

1 ☐ All of the time
2 ☐ Most of the time
3 ☐ Some of the time
4 ☐ A little of the time
5 ☐ None of the time

If you answered either little, some, most or all of the time, please **write** how your mental health restricts your ability to be physically active:

____

____

____*(Please write)*

14 What medications you are currently prescribed?

____

____

____

____*(please write)*

15 **To what extent do you experience side effects from your medications?**

1 ☐ All of the time
2 ☐ Most of the time
3 ☐ Some of the time
4 ☐ A little of the time
5 ☐ None of the time

What side effects are you experiencing?

____

____

____

____*(please write)*

THANK YOU FOR THE TIME AND EFFORT YOU PUT INTO COMPLETING THIS SURVEY

E.8 Post stage one survey (repeated baseline survey (E.6) with feedback items replacing demographic items)

Please complete the following questions regarding your feedback for the physical activity counselling clinic

For the following questions, **please circle one number only**, with 1 indicating that you are not satisfied and 10 indicating that you are very satisfied.

3 Overall how **satisfied** were you with the physical activity counselling clinic? (Please circle)

Not Satisfied	1	2	3	4	5	6	7	8	9	10	**Very Satisfied**

4 Overall how **satisfied** were you with the sessions with the **nurse**? (Please circle)

Not Satisfied	1	2	3	4	5	6	7	8	9	10	**Very Satisfied**

5 Overall how **satisfied** were you with the sessions with the **medical practitioner**? (Please circle)

Not Satisfied	1	2	3	4	5	6	7	8	9	10	**Very Satisfied**

6 Overall how **helpful** was the **pedometer**? (Please circle)

Not Helpful	1	2	3	4	5	6	7	8	9	10	**Very Helpful**

7 Overall how **helpful** were the **written materials** you received? (Please circle)

Not Helpful	1	2	3	4	5	6	7	8	9	10	**Very Helpful**

8 Was there anything that made it difficult for you to attend the clinic?

9 What were the **positive** aspects of the clinic?

Please comment

10 What were the **negative** aspects of the clinic?

Please comment

11 What changes could be made to improve the clinic?

Please comment

12 Do you have any other comments you would like to make regarding the clinic? Please comment

____

____

____

____

____

____

____

____

____

____

____

____

THANK YOU FOR THE TIME AND EFFORT YOU PUT INTO COMPLETING THIS SURVEY

E.9 Post stage two survey (repeated baseline survey (E.6) with feedback items replacing demographic items)

Please complete the following questions regarding your feedback for the physical activity counselling program

1. During the physical activity counselling program, you had the option to see the nurse every 3 weeks for the first 5 months, and then every 6 weeks for the next 3 months. How often would you prefer to see the nurse for physical activity counselling during the following time frames?

   a. During the first two months of the program: (*please tick one box*)

   ☐ weekly ☐ every two weeks ☐ every 3 weeks ☐ monthly

   b. Between months 3 – 5 of the program: (*please tick one box*)

   ☐ weekly ☐ every two weeks ☐ every 3 weeks ☐ monthly

   ☐ every 5 weeks ☐ every 6 weeks

   c. Between months 6 – 8 of the program: (*please tick one box*)

   ☐ weekly ☐ every two weeks ☐ every 3 weeks ☐ monthly

   ☐ every 5 weeks ☐ every 6 weeks ☐ every 8 weeks

   ☐ every 12 weeks

2. How long do you think the physical activity counselling program should go for overall (program duration)?

   ☐ 1 month

   ☐ 3 months

   ☐ 5 months

   ☐ 8 months

   ☐ 12 months

   ☐ 18 months

   ☐ other (please write) ____

3. Do you have any other comments you would like to make regarding the program?

E.10 Activity diary

Participant number: ___________

Activity Diary

Start Date: ______________________

What is this study about?

★ This study is about the effectiveness of a physical activity counselling program on improving the physical activity levels, physical health and wellbeing in adults with mental illness.

What does the study require you to do?

★ The study requires you to wear an activity monitor (a small device that you wear on your hip to measure movement), and to complete this diary for **7 consecutive days** prior to your assessment in week 1 and 19.

Your answers in this diary are **completely confidential**. No one will see your answers except the researchers. Your name will not be on this diary.

Instructions

4. Please start wearing the activity monitor **one week before your next appointment**. Start using the diary the same day.

7. Please wear the activity monitor **during the day and night**, even if you have a sleep or a rest during the day.

8. The activity monitor is not waterproof. Please **take it off** in water, e.g. showering, bathing.

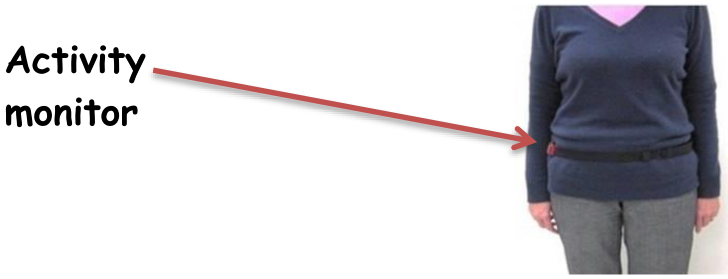
9. Please wear the activity monitor for **7 consecutive days**.

10. Please keep the diary for the **7 consecutive days**

11. At the **end** of the 7 consecutive days, please complete the questionnaire at the back of the diary. The research nurse will then collect the diary and activity monitor from you at your next appointment.

HOW TO WEAR THE ACTIVITY MONITOR

- The activity monitor can be worn either above or below clothing. It is not necessary for the activity monitor to make contact with your skin. However, the activity monitor must fit snugly against your body to collect the best data. We suggest wearing it over an undergarment so it does not itch.
- The elastic belt runs through the back of the activity monitor and the belt should be against your body/clothing (as per picture below).
- Place the activity monitor and attached belt on or around your hips so the activity monitor sits on your **right** hip.
- Please keep the placement of the activity monitor consistent over the seven days.



The Physical Activity Diary

6. Please record the times that you did not wear the activity monitor by ticking the **not worn** box as shown in the example below.
7. Please also record the times in which you did some **physical activity** that was **longer than 10 minutes** in duration.
8. Please record the time you went to bed each night and the time you woke up each morning.
9. Please write beside each box the reason you were not wearing the activity monitor, i.e. shower, bath or the type of physical activity you were doing.
10. Please complete the questions at the bottom of each page related to your sitting time and other activities you participated in during the day.

***Please note**: If at any time you do not want to write your activity details due to personal reasons, leave the description section blank (please still tick the boxes and write the times).*

__Example of how to complete the diary__:

Remember to record and give a description for:

★ The length of time you did not wear the activity monitor

★ The length of time you did some physical activity

Date: 12.05.2013

Day of week:

Monday Tuesday Wednesday Thursday Friday Saturday Sunday

What time did you go to bed last night? 10.00pm

What time did you wake up this morning? 7.30am

Did you wear the activity monitor to bed last night? ☐ Yes ☑ No

If **No**: What time did you take the activity monitor off? 10.00pm

What time did you put the activity monitor back on? 7.00am

Time	Information	Description
08.15 am **to** 09.00am	☐ NOT WORN ☑ PHYSICAL ACTIVITY	Went on the morning walking group
09.00 am **to** 09.30am	☑ NOT WORN ☐ PHYSICAL ACTIVITY	Showering
2.00 pm **to** 2.30 pm	☐ NOT WORN ☑ PHYSICAL ACTIVITY	Attended the gym – bike

Please estimate how much time you spend **sitting today** in the following situations: (please write you answer). If not applicable write **0**.

		Hours	Minutes
a.	While traveling to and from places	1	30
b.	While at work	7	0
c.	While using a computer / smart phone (not at work)	0	30
d.	While watching television	1	0
e.	In your leisure time, NOT including television (e.g. visiting friends, movies, dining out etc.)	2	0

If you have any further questions on how to answer this activity diary, please contact Sarah Fraser on 3721 8019 (Monday & Wednesday) or 3365 4998 (Tuesday, Thursday & Friday) or email: s.guthrie@uq.edu.au

Date:

Day of week:

1 Monday 2 Tuesday 3 Wednesday 4 Thursday 5 Friday 6 Saturday 7 Sunday

What time did you go to bed last night? ________________

What time did you get up this morning? ________________

Did you wear the activity monitor to bed last night? ☐ Yes ☐ No

If **No**: What time did you take the activity monitor off? __________

What time did you put the activity monitor back on? __________

Time	Information	Description
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	

Please estimate how much time you spend **sitting today** in the following situations: (please write you answer). If not applicable write **0**.

		Hours	Minutes
a.	While traveling to and from places		
b.	While at work		
c.	While using a computer / smart phone (not at work)		
d.	While watching television		
e.	In your leisure time, NOT including television (e.g. visiting friends, movies, dining out etc.)		

Date:

Day of week:

1 Monday 2 Tuesday 3 Wednesday 4 Thursday 5 Friday 6 Saturday 7 Sunday

What time did you go to bed last night? ___________________

What time did you get up this morning? ___________________

Did you wear the activity monitor to bed last night? ☐ Yes ☐ No

If **No**: What time did you take the activity monitor off? ___________

What time did you put the activity monitor back on? ___________

Time	Information	Description
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	

Please estimate how much time you spend **sitting today** in the following situations: (please write you answer). If not applicable write **0**.

		Hours	Minutes
a.	While traveling to and from places		
b.	While at work		
c.	While using a computer / smart phone (not at work)		
d.	While watching television		
e.	In your leisure time, NOT including television (e.g. visiting friends, movies, dining out etc.)		

Date:

Day of week:

1 Monday 2 Tuesday 3 Wednesday 4 Thursday 5 Friday 6 Saturday 7 Sunday

What time did you go to bed last night? ________________

What time did you get up this morning? ________________

Did you wear the activity monitor to bed last night? ☐ Yes ☐ No

If **No**: What time did you take the activity monitor off? __________

What time did you put the activity monitor back on? __________

Time	Information	Description
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	

Please estimate how much time you spend **sitting today** in the following situations: (please write you answer). If not applicable write **0**.

		Hours	Minutes
a.	While traveling to and from places		
b.	While at work		
c.	While using a computer / smart phone (not at work)		
d.	While watching television		
e.	In your leisure time, NOT including television (e.g. visiting friends, movies, dining out etc.)		

Date:

Day of week:

1 Monday 2 Tuesday 3 Wednesday 4 Thursday 5 Friday 6 Saturday 7 Sunday

What time did you go to bed last night? __________________

What time did you get up this morning? __________________

Did you wear the activity monitor to bed last night? ☐ Yes ☐ No

If **No**: What time did you take the activity monitor off? ___________

What time did you put the activity monitor back on? ___________

Time	Information	Description
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	

Please estimate how much time you spend **sitting today** in the following situations: (please write you answer). If not applicable write **0**.

		Hours	Minutes
a.	While traveling to and from places		
b.	While at work		
c.	While using a computer / smart phone (not at work)		
d.	While watching television		
e.	In your leisure time, NOT including television (e.g. visiting friends, movies, dining out etc.)		

Date:

Day of week:

1 Monday 2 Tuesday 3 Wednesday 4 Thursday 5 Friday 6 Saturday 7 Sunday

What time did you go to bed last night? ___________________

What time did you get up this morning? ___________________

Did you wear the activity monitor to bed last night? ☐ Yes ☐ No

If **No**: What time did you take the activity monitor off? ___________

What time did you put the activity monitor back on? ___________

Time	Information	Description
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	

Please estimate how much time you spend **sitting today** in the following situations: (please write you answer). If not applicable write **0**.

		Hours	Minutes
a.	While traveling to and from places		
b.	While at work		
c.	While using a computer / smart phone (not at work)		
d.	While watching television		
e.	In your leisure time, NOT including television (e.g. visiting friends, movies, dining out etc.)		

Date:

Day of week:

1 Monday 2 Tuesday 3 Wednesday 4 Thursday 5 Friday 6 Saturday 7 Sunday

What time did you go to bed last night? ________________

What time did you get up this morning? ________________

Did you wear the activity monitor to bed last night? ☐ Yes ☐ No

If **No**: What time did you take the activity monitor off? __________

What time did you put the activity monitor back on? __________

Time	Information	Description
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	

Please estimate how much time you spend **sitting today** in the following situations: (please write you answer). If not applicable write **0**.

		Hours	Minutes
a.	While traveling to and from places		
b.	While at work		
c.	While using a computer / smart phone (not at work)		
d.	While watching television		
e.	In your leisure time, NOT including television (e.g. visiting friends, movies, dining out etc.)		

Date:

Day of week:

1 Monday 2 Tuesday 3 Wednesday 4 Thursday 5 Friday 6 Saturday 7 Sunday

What time did you go to bed last night? ___________________

What time did you get up this morning? ___________________

Did you wear the activity monitor to bed last night? ☐ Yes ☐ No

If **No**: What time did you take the activity monitor off? ___________

What time did you put the activity monitor back on? ___________

Time	Information	Description
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	
to	☐ NOT WORN ☐ PHYSICAL ACTIVITY	

Please estimate how much time you spend **sitting today** in the following situations: (please write you answer). If not applicable write **0**.

		Hours	Minutes
a.	While traveling to and from places		
b.	While at work		
c.	While using a computer / smart phone (not at work)		
d.	While watching television		
e.	In your leisure time, NOT including television (e.g. visiting friends, movies, dining out etc.)		

Please complete the following questions before handing this diary and the activity monitor back to the nurse researcher.

*For the next **eight** questions please **circle** a number from 1 – 10, with 1 being the easiest and 10 being the most difficult.*

13 Overall how easy or difficult was it to complete this the physical activity diary?

Easy	1	2	3	4	5	6	7	8	9	10	**Difficult**

14 How easy or difficult was it to wear the activity monitor during waking hours?

Easy	1	2	3	4	5	6	7	8	9	10	**Difficult**

3 How easy or difficult was it to wear the activity monitor when asleep?

Easy	1	2	3	4	5	6	7	8	9	10	**Difficult**

4 How easy or difficult was it to record the time you took off and put on the activity monitor?

Easy	1	2	3	4	5	6	7	8	9	10	**Difficult**

5 How easy or difficult was it to record <u>the time (if)</u> you did (any) physical activity?

Easy	1	2	3	4	5	6	7	8	9	10	**Difficult**

6 How easy or difficult was it to record <u>the type</u> (if) you did (any) physical activity?

Easy	1	2	3	4	5	6	7	8	9	10	**Difficult**

7 How easy or difficult was it to record your sitting time each day?

Easy	1	2	3	4	5	6	7	8	9	10	**Difficult**

8 Do you have any other comments you would like to make regarding the activity monitor and diary?

Please comment

E.11 Step log

Daily Step Log

Name:

1st	2nd	3rd	4th	5th	6th	7th
8th	9th	10th	11th	12th	13th	14th
15th	16th	17th	18th	19th	20th	21st
22nd	23rd	24th	25th	26th	27th	28th
29th	30th	31st				

MONTH:

E.12 Food and mood diary

Food'n'Mood
JOURNAL

Date: ______ Mon Tue Wed Thurs Fri Sat Sun Weight: ______

Check # 8 ounce glasses of water: ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Time	Place	Food/Beverage	How Much	Mood Before	Mood After

What's your Mood: exhausted, angry, sad, frustrated, stressed, depressed, overwhelmed, anxious, lonely, jealous, bored, hopeful, con dent, happy, thrilled, etc.

My Day in Review: (Times/situations/moods likely to cause cravings, types of food most likely to crave, etc.):

....

....

....

Behaviors that require my attention: ....

....

....

Notes: ....

....

....

....

E.13 Initial physical activity counselling framework

Intervention Session 1 (First face-to-face)

STAGE	DETAIL	COUNSELLING
ASSESS	Knowledge and beliefs	*What do you know about the benefits of physical activity for physical and mental health?* *How much physical activity should you do each week?*
	Current physical activity	*Tell me about what physical activity you did last week* Ask about the frequency, intensity, type and time engaged in physical activity.
	Psychosocial factors	*How do you feel about doing (more) physical activity?* *What reasons do you have to do (more) physical activity?* *What reasons do you have for not wanting to do (more) physical activity?* *What makes engaging in (more) physical activity difficult for you?* *What support do you have to assist you in becoming (more) physically active?* *What else might help you to do (more) physical activity?*
ADVISE	Personalised	*There are some advantages and challenges for you to do (more) physical activity* (reflect participant information). Provide physiological feedback. *Lets discuss how these results are affecting your physical health.*
	Confirm understanding and correct misconceptions	Discuss the benefits of physical activity for physical health (e.g. reduced metabolic risk factors and reduced risk of non-communicable diseases such as diabetes, cardiovascular disease). Discuss the benefits of physical activity for improving mental health (e.g. increase uptake of serotonin, improved body image, provides structure, improves sleeps and provides a distraction for negative thoughts). Correct any misconceptions regarding physical activity beliefs.
	Advice to change	Give clear and strong advice to do (more) activity.
	Recommendations	*The recommendations for physical activity are 150-300 minutes of moderate intensity activity per week*
AGREE	Establish a contract	*Are you willing to work together to increase your physical activity levels?*
	Goal setting	Agree on goals that are specific, measureable and attainable within an established timeframe.

STAGE	DETAIL	COUNSELLING
	Respond to ambivalence	Restate personalised advantages and challenges. Restate advice to change, highlighting benefits. Offer support.
ASSIST	Action planning	*Lets work together to develop an action plan for physical activity.* The plan should consist of activities that are safe, enjoyable and are likely to be accomplished. The plan should include the type, frequency, intensity, duration and location of physical activity, and include any additional support or assistance required, i.e.: *What type of physical activity would you prefer?* *How often are you able to do physical activity over the next (agreed time frame) and how long for each time?* *Where would suit you to do physical activity?* *Would you prefer to do physical activity with someone or alone?* *Who will help you stick with your physical activity plan?*
	Support	Explore successful and unsuccessful approaches to change physical activity in the past. Identify coping strategies to manage competing life demands and barriers to physical activity
	Summarise action plan and provide a written copy	*So the action plan for the next (established timeframe) is…. (Include type, frequency, duration, location and support).* Provide a written summary of the agreed action plan
	Resources	Provide physical activity self-monitoring tools, i.e. pedometers and model how they work. Provide printed support materials for physical activity engagement (i.e. community resources, local walking tracks, physical activity guidelines)
ARRANGE	Support	Provide positive reinforcement: *I am so pleased that you are going to do more physical activity.* *Physical activity is one of the best ways to improve physical health and it also has great benefits for mental health* (Reflect personalized goals)
	Follow-up	Our next session will be ……

E.14 Follow-up physical activity counselling framework

Follow-up intervention sessions (face-to-face)

STAGE	DETAIL	COUNSELLING
ASSESS	Current physical activity	*Tell me about what physical activity you did since we last met* Ask about the frequency, intensity, type and time engaged in physical activity
	Psychosocial factors	*How did you feel about doing more physical activity?* *What have you noticed since doing more physical activity?* *What got in the way of doing physical activity or made it more difficult for you to do?* *What else has helped you?*
ADVISE	Acknowledge effort	*Although it may be difficult at times, physical activity is very important for your health, so keep up the good work.*
	Personalised	*There are some advantages and challenges for you to do more physical activity* (reflect participant information). Re-advise of the benefits for physical and mental health. Provide physiological feedback. *Lets discuss how these results are affecting your physical health.*
	Confirm understanding and correct misconceptions	Based on participant information Realistic expectations
	Advice to continue	Give clear and strong advice to continue to do physical activity
AGREE	Acknowledgment	*Last time we met, we agreed that you would….* *Since then, I hear that you are doing (type) for (frequency) for (time)* (paraphrase what the person has said). Provide acknowledgement and positive feedback.
	Establish a contract	*Are you willing to continue working together to increase your physical activity levels?*
	Goal setting	Agree on goals that are specific, measureable and attainable within an established timeframe.
	Respond to ambivalence	Restate personalised advantages and challenges Restate advice to change, highlighting benefits Offer support

STAGE	DETAIL	COUNSELLING
ASSIST	Acknowledgement	*It's great that you are doing/willing to do more physical activity.* *Physical activity is one of the best things you can do for your physical and mental health* Reflect personalised interests
	Review action plan	*Lets review the action plan* (change as required) *What type of physical activity would you prefer?* *How often are you able to do physical activity over the next (agreed time frame) and how long for each time?* *Where would suit you to do physical activity?* *Would you prefer to do physical activity with someone or alone?* *Who will help you stick with your physical activity plan?*
	Problem solving	*What might you do to overcome that barrier?* *What have you done before to make it easier for you?* *Is there anything else that makes it difficult for you to do the agreed physical activity?*
	Summarise action plan and provide a written copy	*So the action plan for the next (established timeframe) is…. (include type, frequency, duration, location and support).* Provide a written summary of the agreed action plan.
ARRANGE	Support	Provide positive reinforcement *I am so pleased that you are doing/going to do more physical activity.* *Physical activity is one of the best ways to improve physical health and it also has positive benefits for mental health* (Reflect personalised goals)
	Follow-up	Our next session will be ……

E.15 Participants' prescribed psychotropic medication at baseline

	Antipsychotic	Mood Stabiliser	Antidepressant	Benzodiazepine
1	Quetiapine XR	Lamotrigine	Nardil	Clonazepam
2			Venlafaxine	
3	Quetiapine XR		Dothiepin	Diazepam
4	Quetiapine	Lamotrigine	Fluoxetine	Diazepam
5	Quetiapine		Fluoxetine	Diazepam
6		Lithium		
7	Quetiapine XR	Lithium	Desvenlafaxine	Clonazepam
8	Quetiapine Aripiprazole	Sodium Valproate	Venlafaxine	
9	Aseniprine Risperidone			
10	Olanzapine		Duloxetine Nortriptyline	Diazepam Clonazepam
11		Carbemazepine	Venlafaxine	
12	Quetiapine Aripiprazole		Duloxetine Agomelatine	
13	Clozapine	Lithium	Fluoxetine	
14			Fluoxetine	
15			Dothiepin	
16			Desvenlafaxine	

E.16 Participants' metabolic risk factors

	Risk Factor	Total
1	↑ Waist circumference (No HDL data)	✓
2	↑ Waist circumference (No blood data)	✓
3	↑ Waist circumference, ↑ TG's[1], ↓ HDL[2], ↑BGL[3]	✓✓✓✓
4	↑ Waist circumference, ↓ HDL smoker	✓✓
5	↑ Waist circumference, ↑ Systolic BP[4], ↑ TG's, ↓ HDL, ↑BGL medication: antihypertensive	✓✓✓✓✓
6	↑ Waist circumference, ↑ Systolic BP, ↓ HDL,	✓✓✓
7	↑ Waist circumference, ↓ HDL Medication: statin	✓✓
8	↑ Waist circumference, ↑ TG's, ↑BGL diabetic, smoker	✓✓✓
9	↑ Waist circumference, ↓ HDL, ↑BGL,	✓✓✓
10	↑ Waist circumference, ↑ Systolic and Diastolic BP, ↑ TG's, ↓ HDL	✓✓✓✓
11	↑ Waist circumference, ↑ Systolic and Diastolic BP, ↑ TG's, ↑BGL medication: statin	✓✓✓✓
12	↑ Waist circumference, ↑ TG's, ↑BGL medication: antihypertensive	✓✓✓✓
13	↑ Waist circumference, ↑ TG's, ↓ HDL	✓✓✓
14	↑ Waist circumference, ↓ HDL	✓✓
15	↑ Waist circumference, ↑ Systolic BP, ↑ TG's, ↓ HDL smoker	✓✓✓✓
16	↑ Waist circumference, ↑ Systolic BP, ↑ TG's medication: antihypertensive	✓✓✓✓

Notes:

[1] Triglycerides

[2] High-density lipoprotein cholesterol

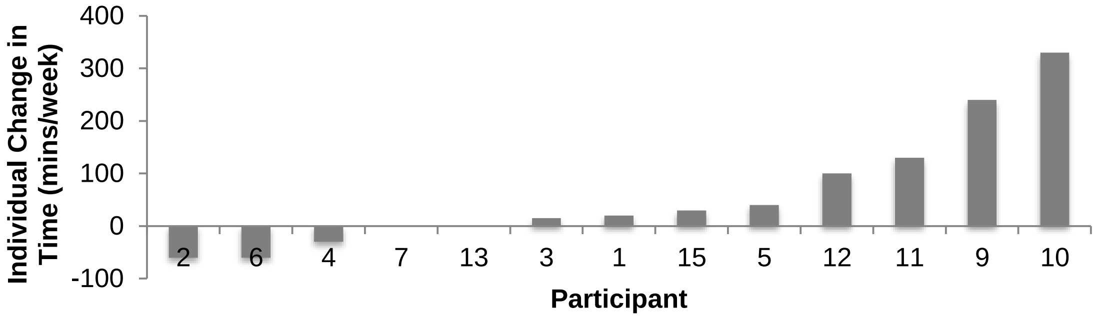
[3] Blood glucose level

[4] Blood pressure

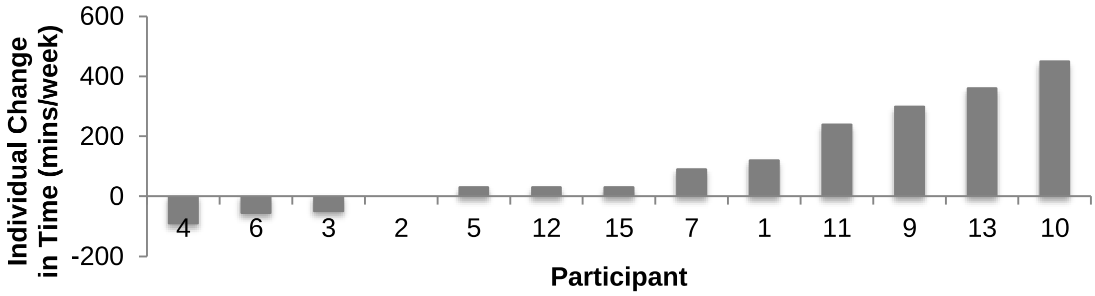
APPENDIX F: Metabolic health counselling study additional results

F.1 Stage one physical activity and sedentary behaviour

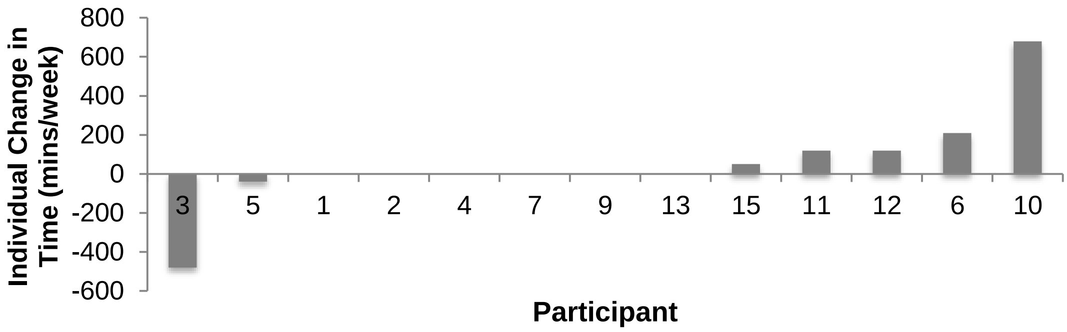
a) Walking for transport



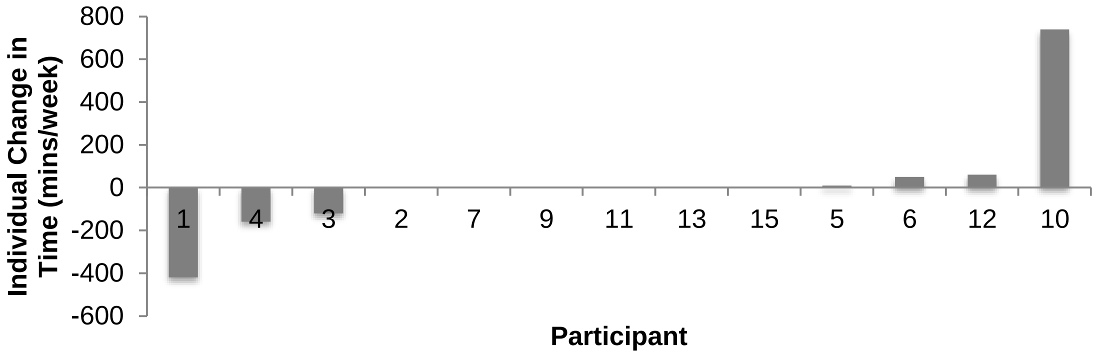
b) Walking for recreation



c) Vigorous intensity yard work



d) Vigorous intensity physical activity



e) Moderate intensity physical activity

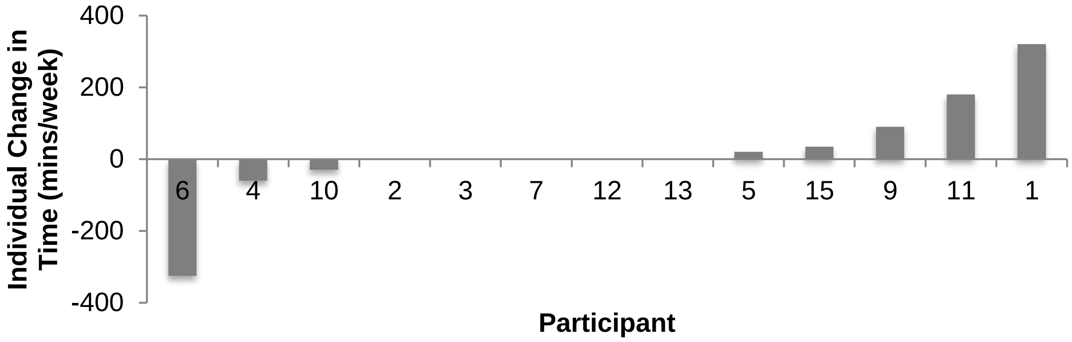
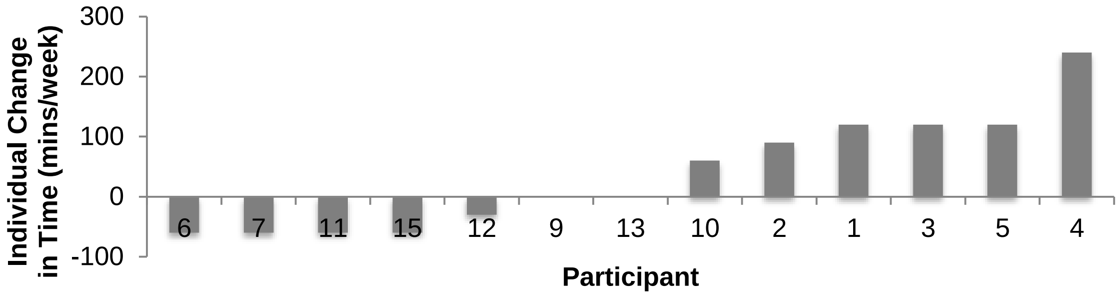
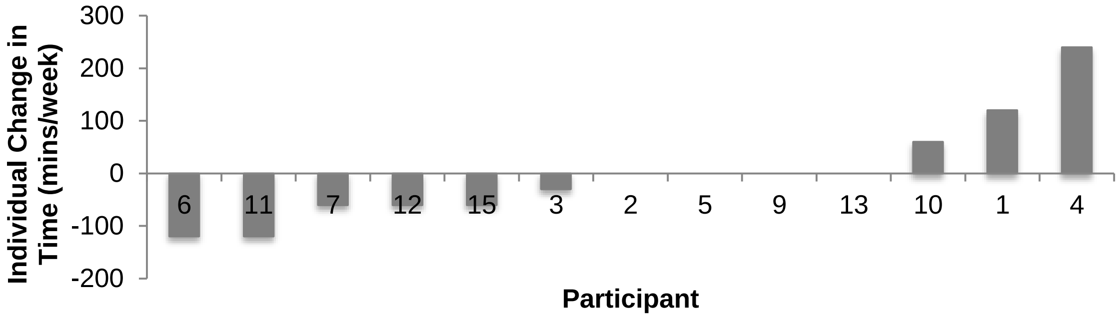


Figure F-1: Individual change in domain specific self-report physical activity between baseline and week 19 (minutes/week) (N = 13)

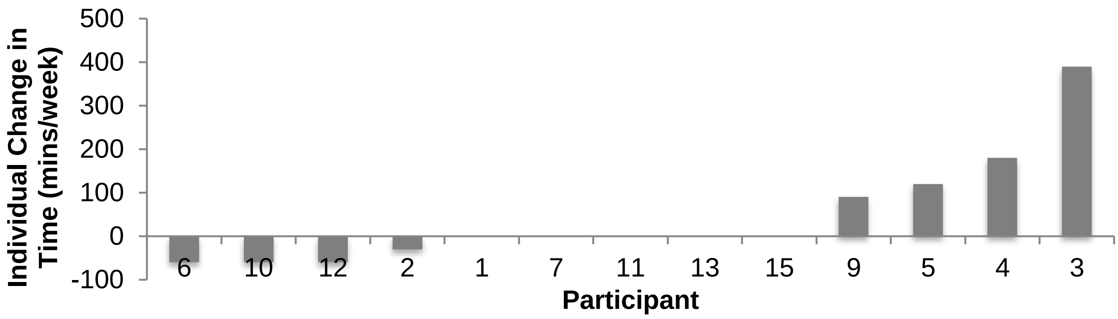
a) Watching television (weekday)



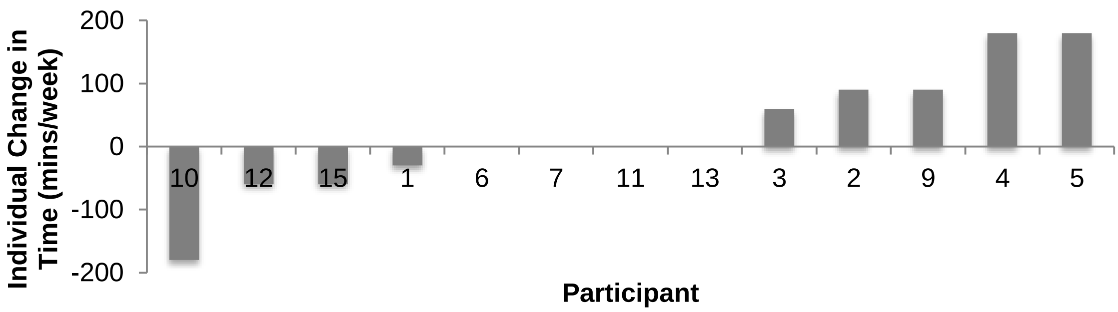
b) Watching television (weekend day)



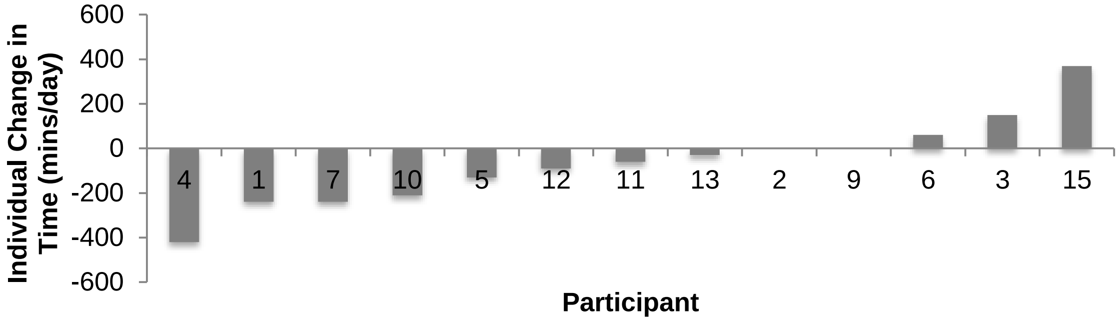
c) Using a computer / smart phone (weekday)



d) Using a computer / smart phone (weekend day)



e) Leisure time (weekday)



f) Leisure time (weekend day)

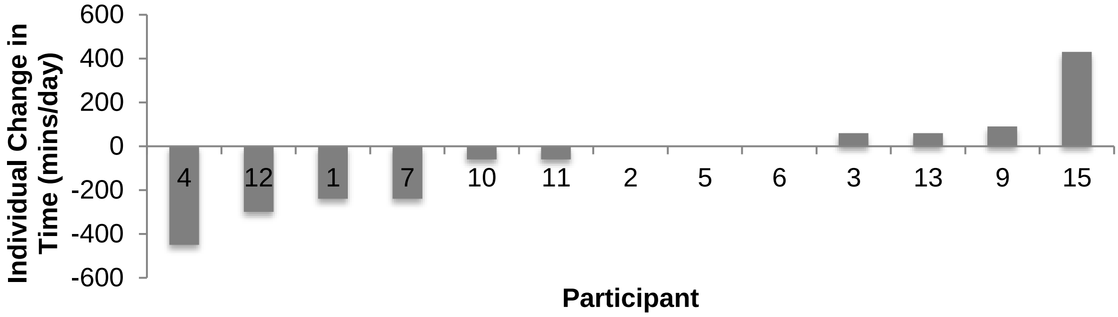
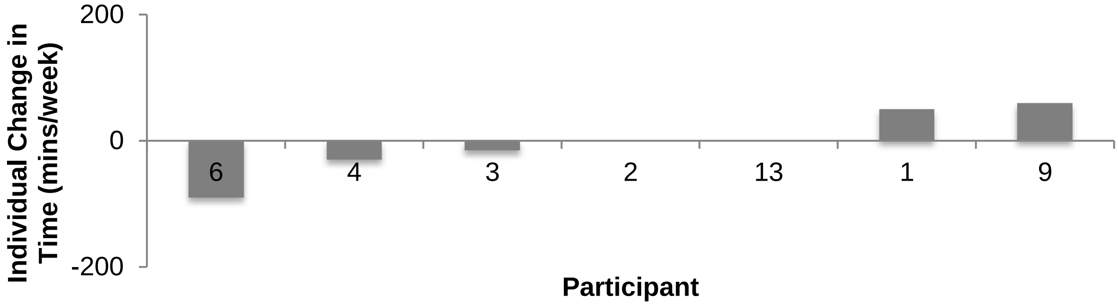


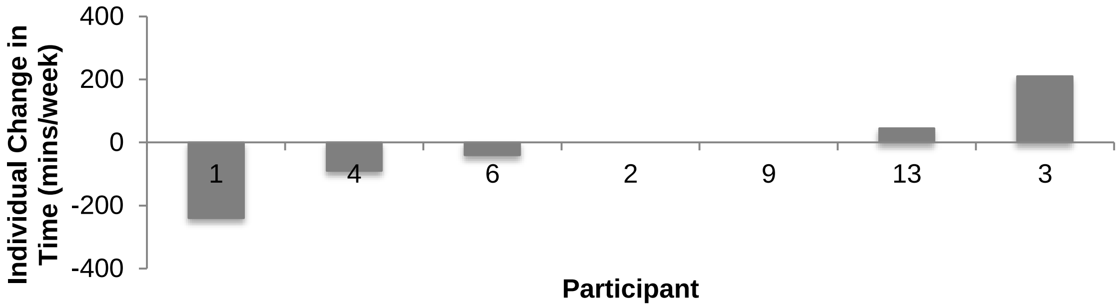
Figure F-2: Individual change in domain specific self-report sedentary behaviour between baseline and week 19 (minutes/day) (N = 13)

F.2 Stage two physical activity and sedentary behaviour

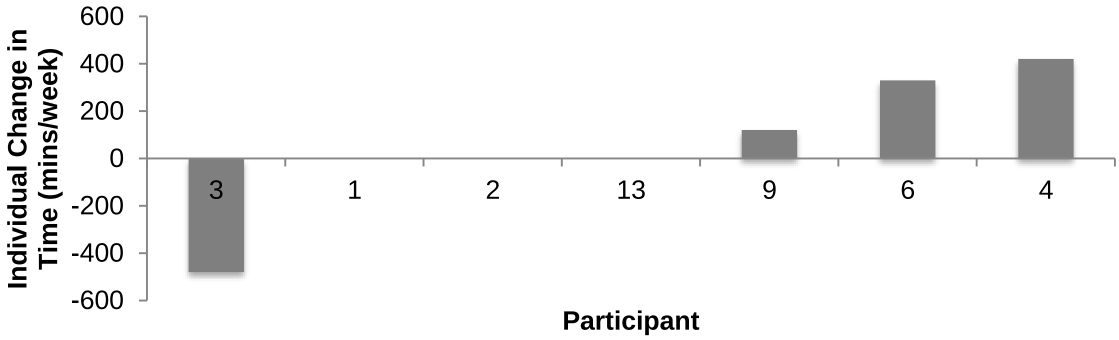
a) Walking for transport



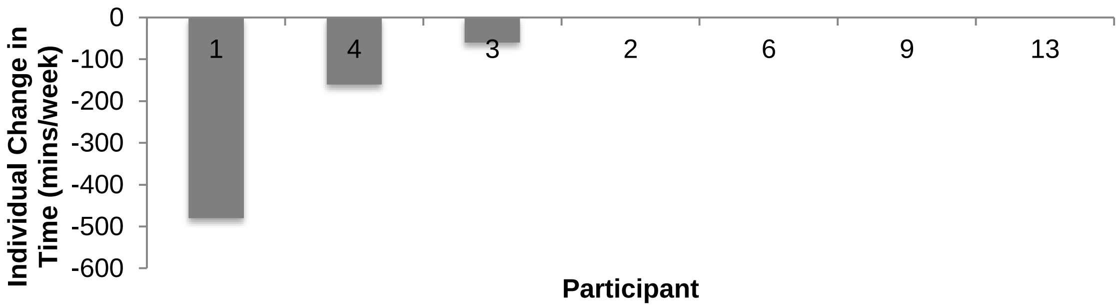
b) Walking for recreation



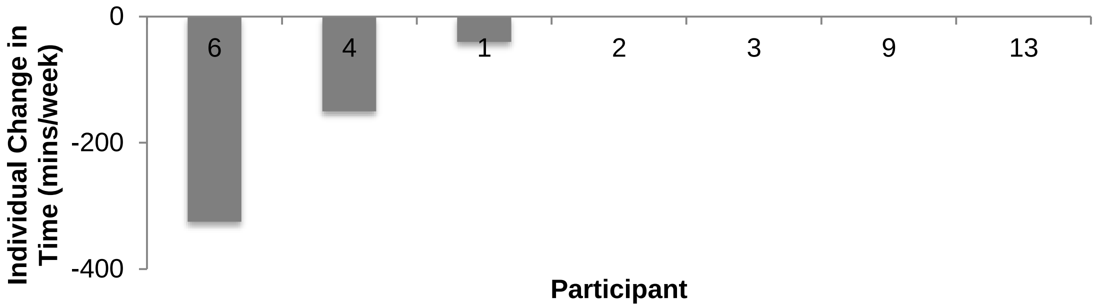
c) Vigorous intensity yard work



d) Vigorous intensity physical activity



e) Moderate intensity physical activity



f) Total self-report physical activity excluding vigorous intensity yard work

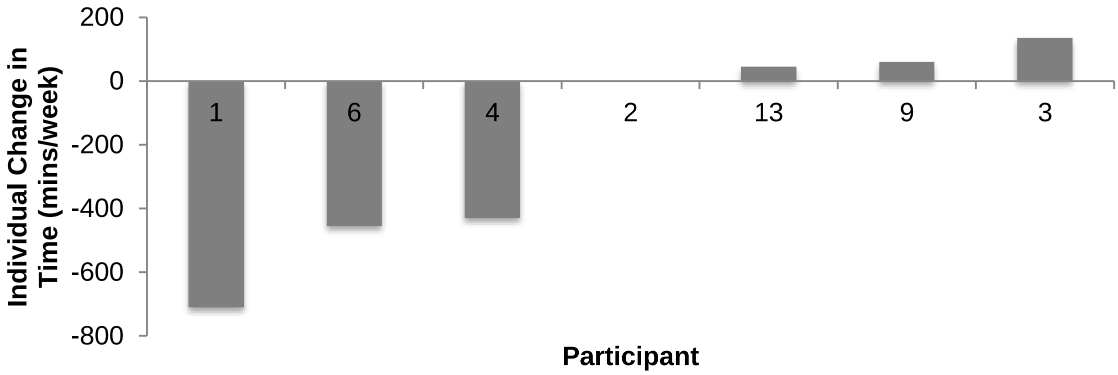
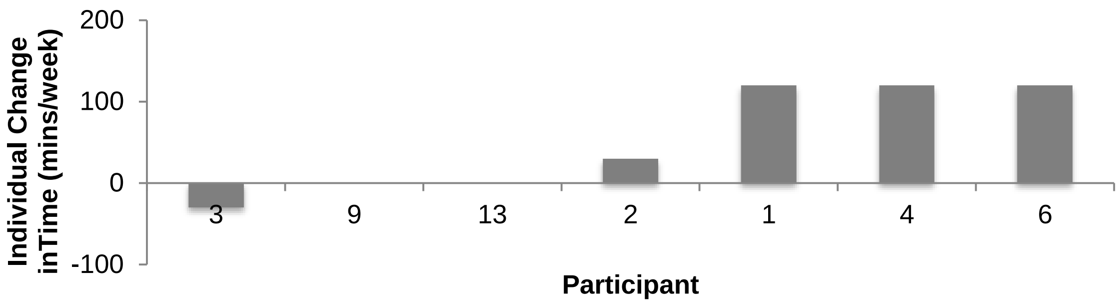
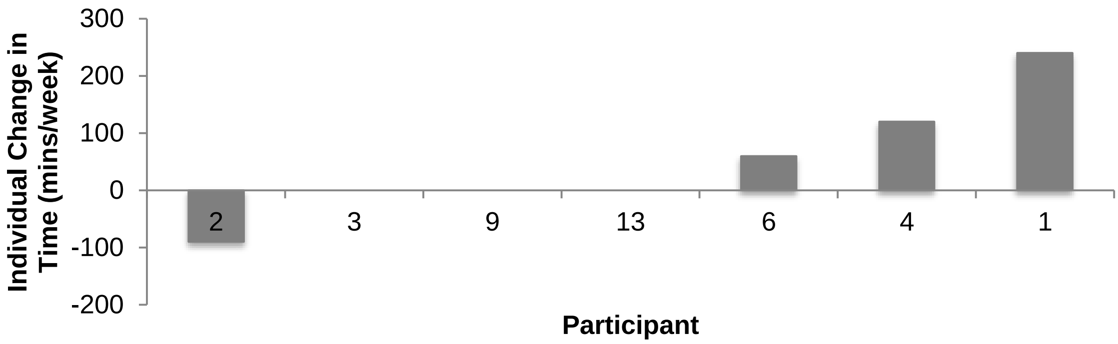


Figure F-3: Individual change in domain specific self-report physical activity between baseline and week 31 (minutes/week) (N = 7)

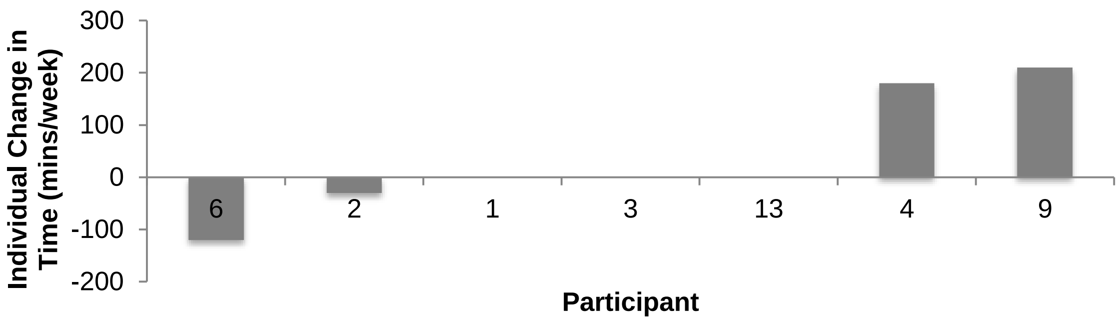
a) Watching television (weekday)



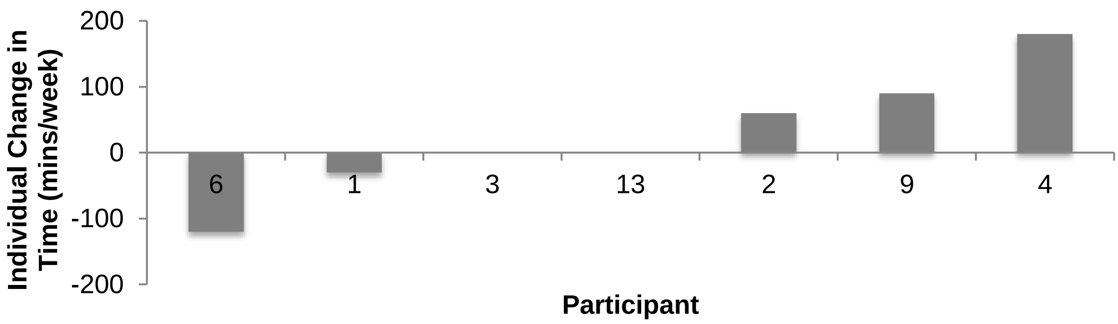
b) Watching television (weekend day)



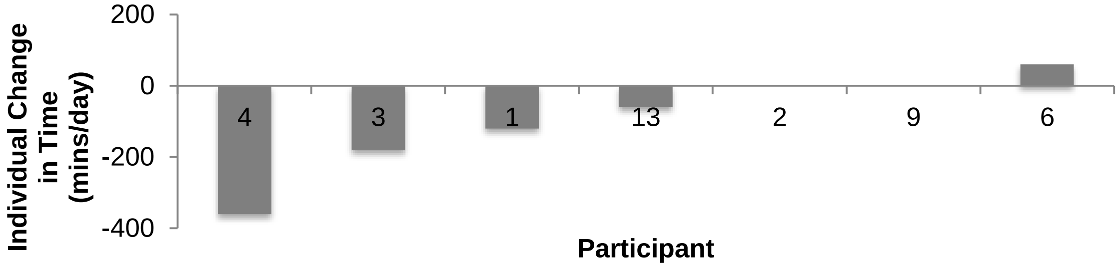
c) Using a computer / smart phone (weekday)



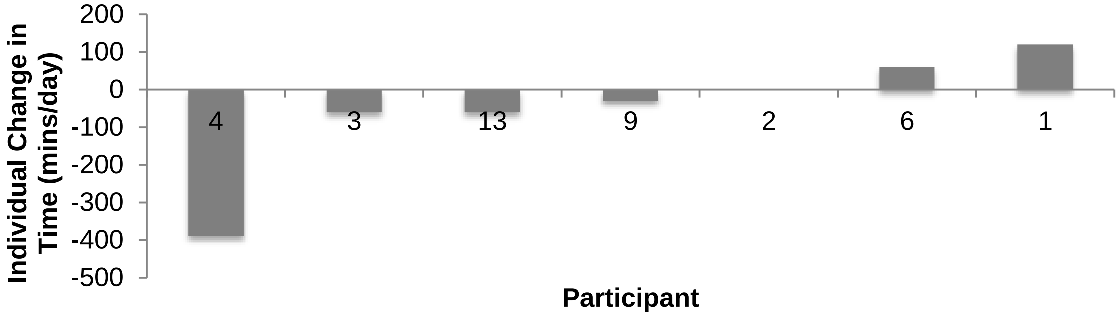
d) Using a computer / smart phone (weekend day)



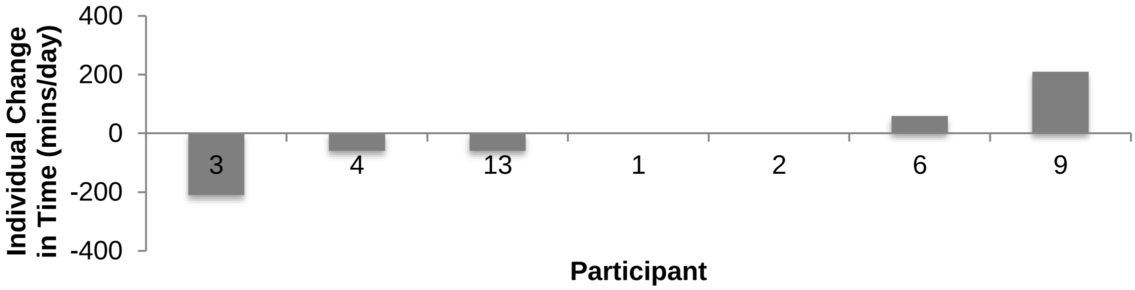
e) Leisure time (weekday)



f) Leisure time (weekend day)



g) Total sedentary behaviour (weekday)



h) Total sedentary behaviour (weekend day)

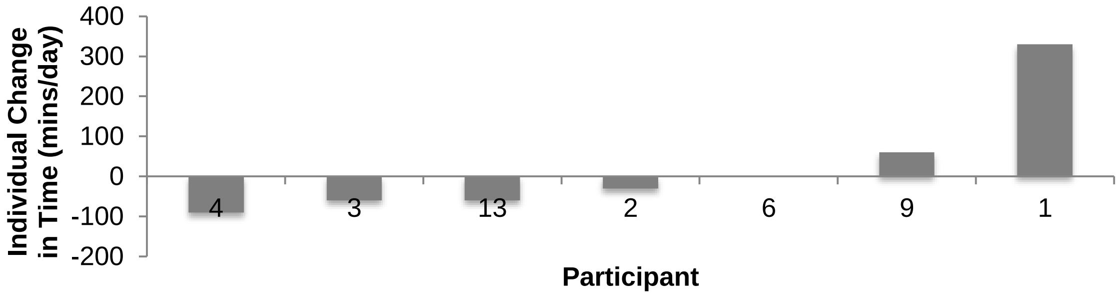
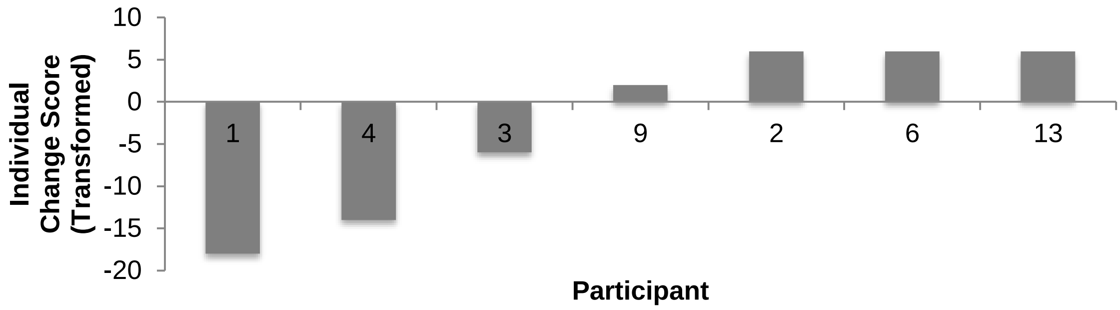


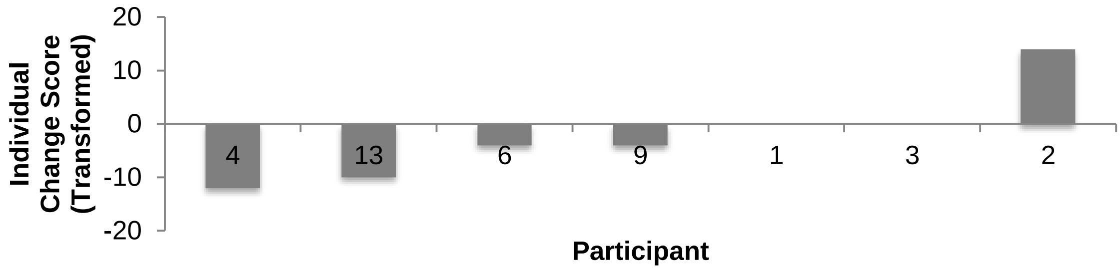
Figure F-4: Individual change in domain specific self-report sedentary behaviour between baseline and week 31 (minutes/day) (N = 13)

F.3 Stage two psychological wellbeing

a) Depression



b) Anxiety



c) Stress

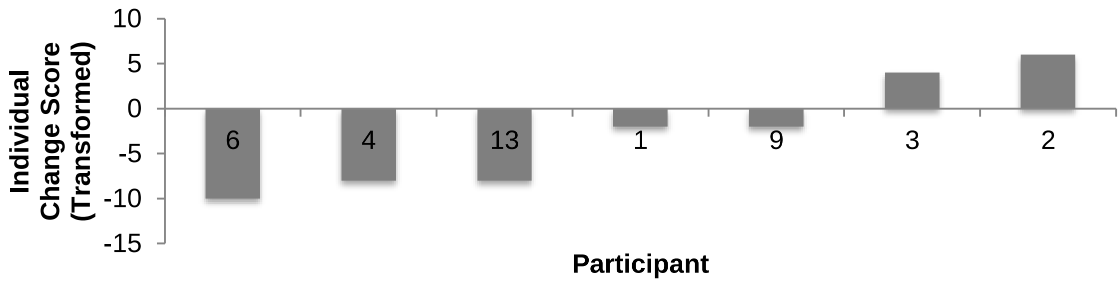


Figure F-5: Individual change in DASS 21 scores between baseline and week 31 (N = 7)

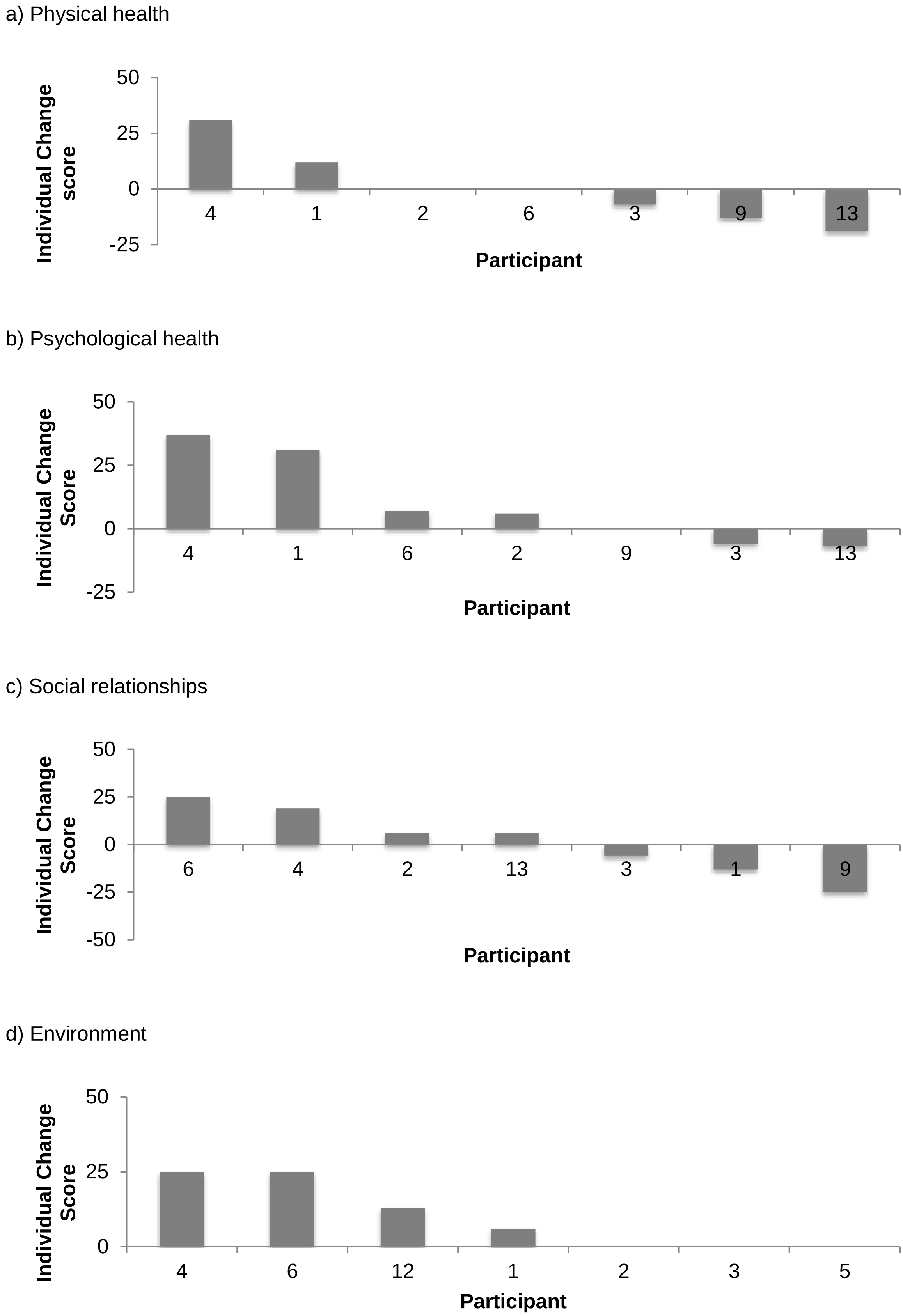


Figure F-6: Individual change in WHOQOL-Bref scores between baseline and week 31 (N = 7)